Cla-Val Automatic Control Valve Training

presented by Leonard Pinchuk- DM Valve

D.M. Valve & Controls Inc.
Innovative Valve Technology

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CLA-VAL Seminar Topics

- Manufacturing
- Principles of Control Valves
- Applications
- Installations
- Technical Support

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Cla-Val Automatic Valve Features

- Drip-tight shut-off
- No packing glands
- No breakaway friction
- No external linkages
- No lubrication needed
- Lowest operating friction

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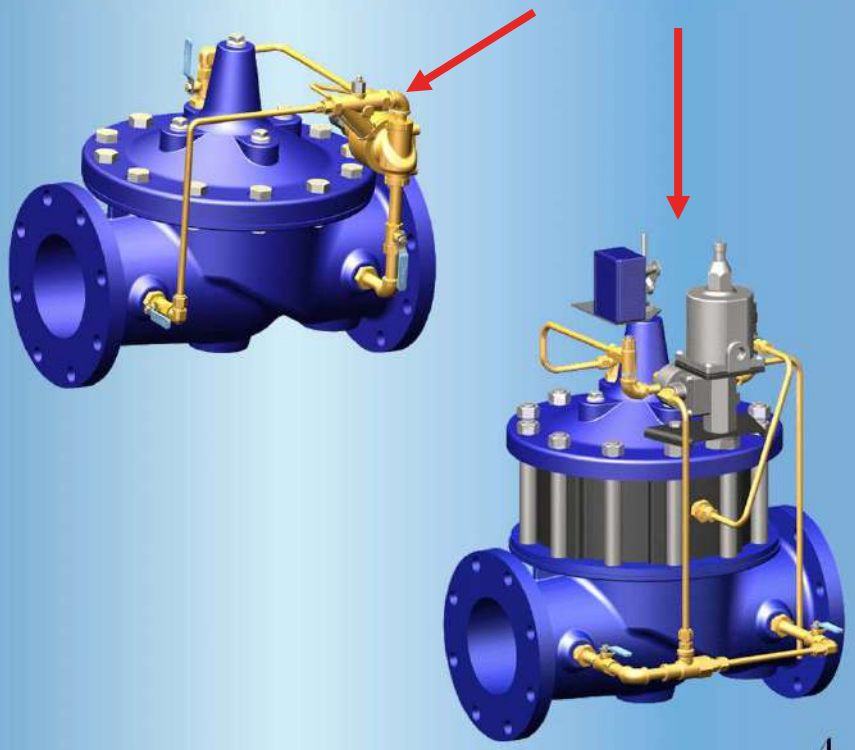
Cla-Val Automatic Control Valves Consist of…

Main Valve

Pilot Control System



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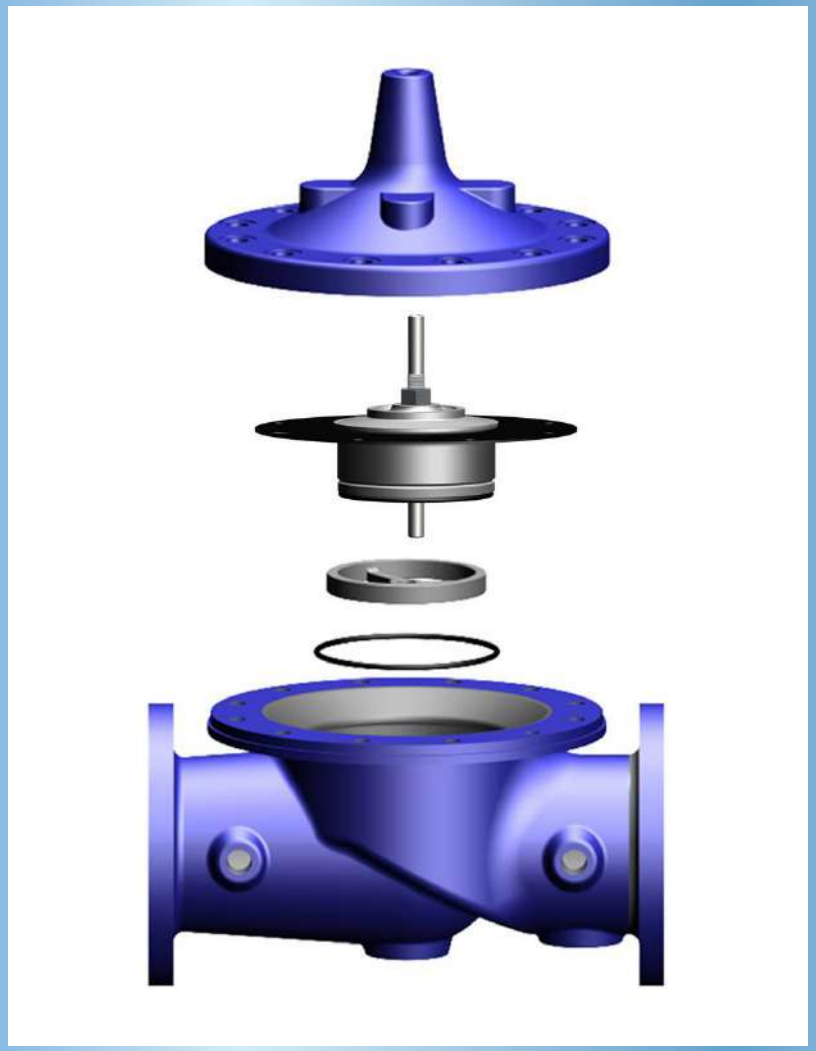
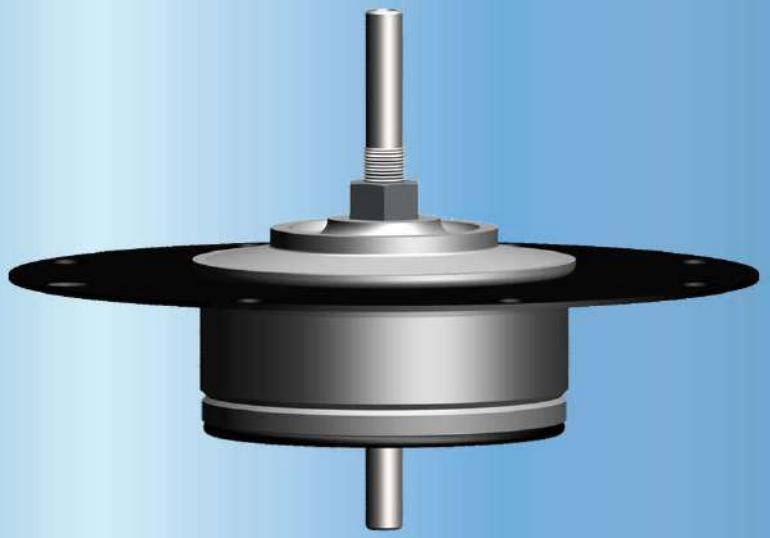
One Moving Part Inside the Valve





Disc & Diaphragm Assembly

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Basic Hydraulics

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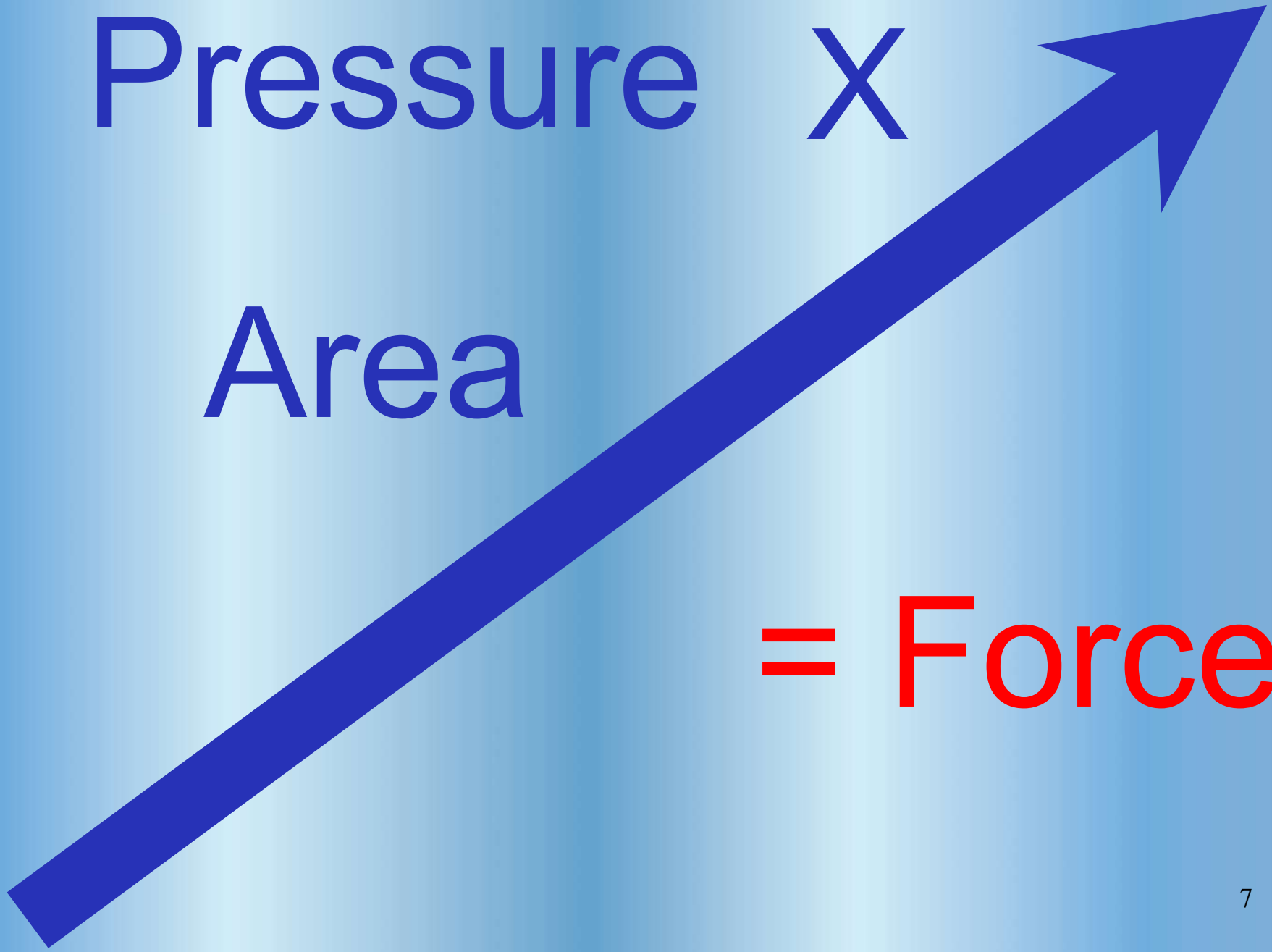
Pressure X

Area



= Force

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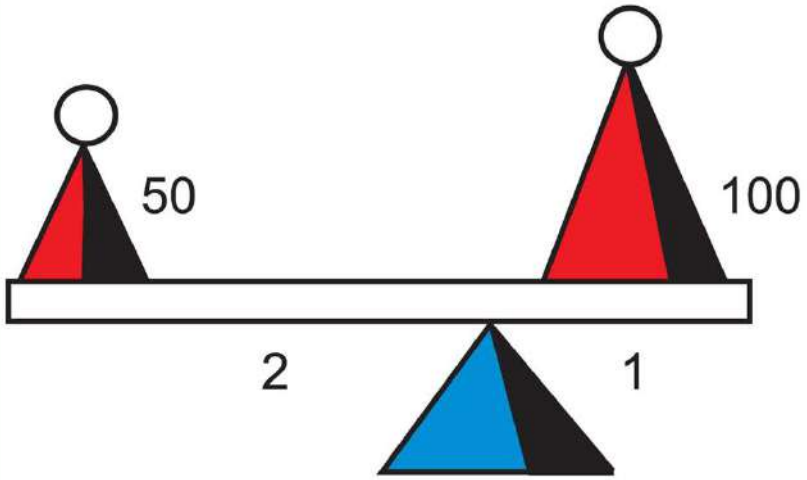
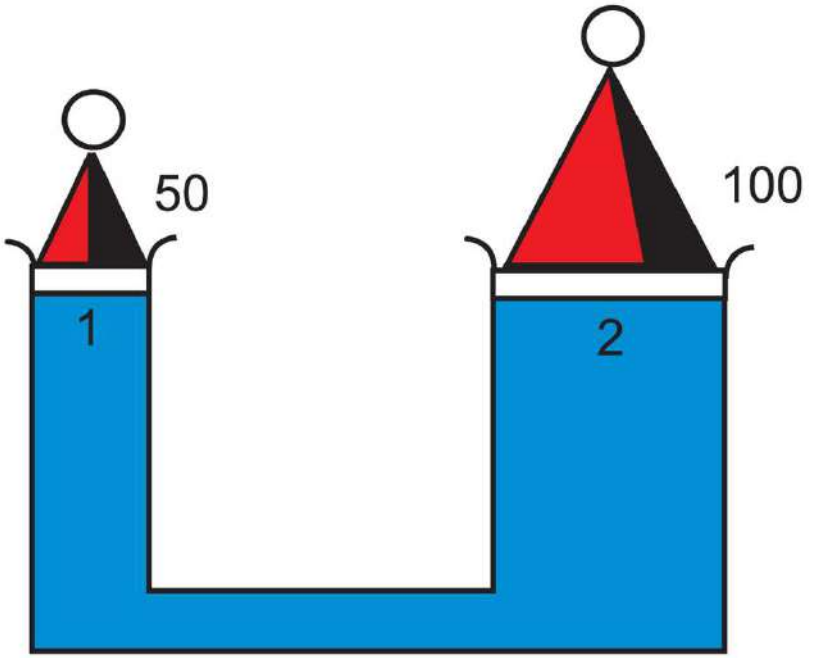
The Hydraulic Advantge





Fluid can be used like levers

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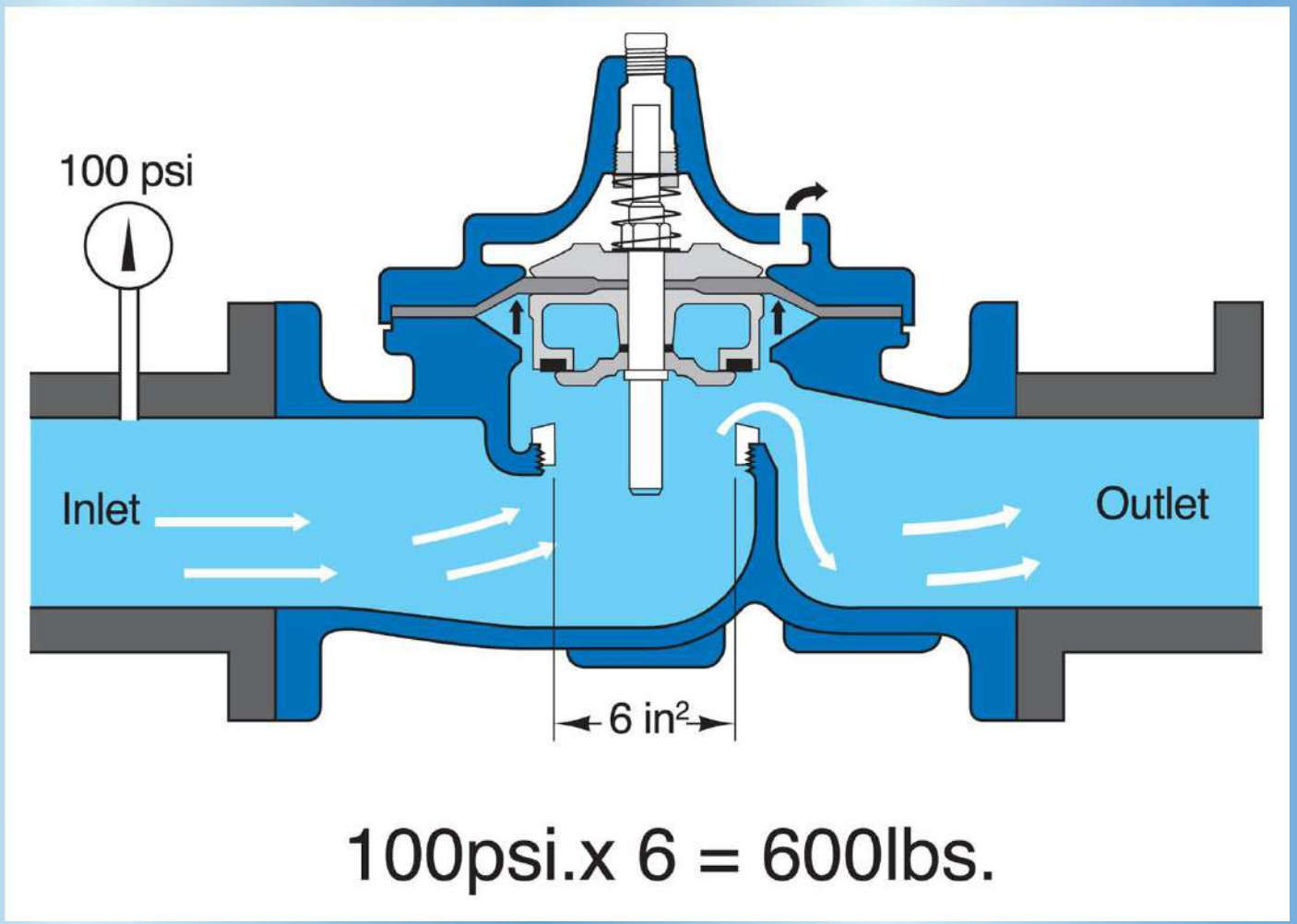
Line Pressure to Open



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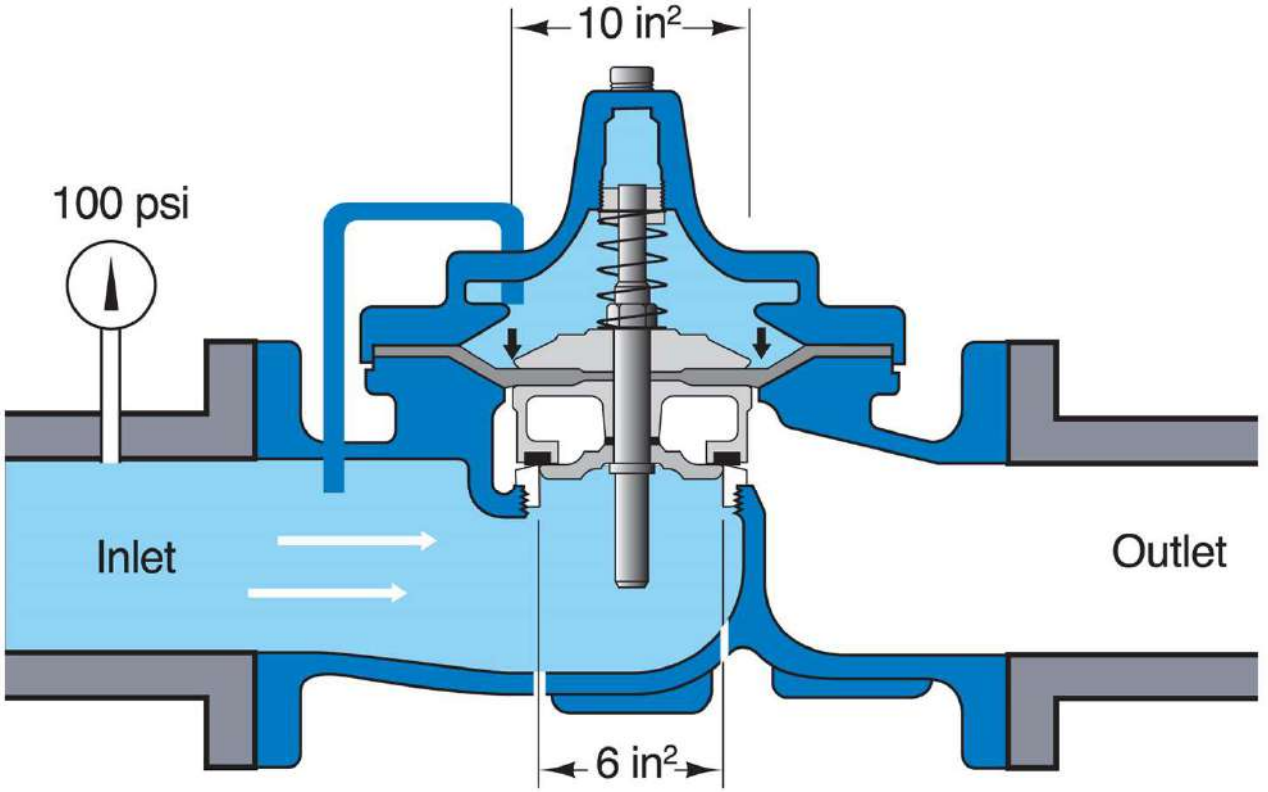
Line Pressure to Close



Closing Force 100 x 10 = 1000 lbs.
Opening Force 100 x 6 = 600 lbs.
Difference = 400 lbs.

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Just a reminder…

- Water on the cover to close the main valve
- Water off the cover to open the main valve
- Knowing this makes troubleshooting easier…

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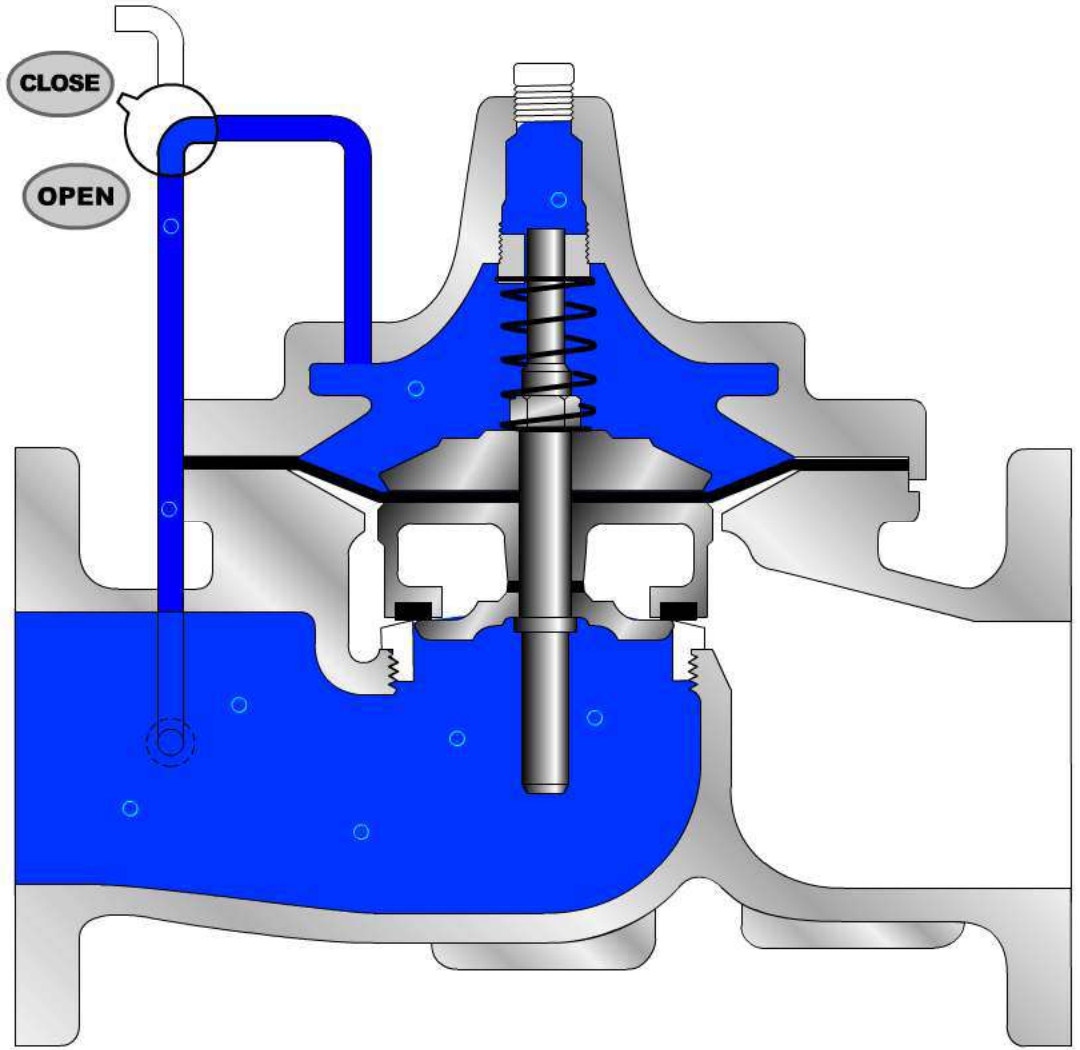
EXIT

Valve Opening/Closing Operation

PLAY PAUSE RESTART



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Main (Basic) Valve

Cla-Val Model
100-01

Hydraulic Control = Hytrol

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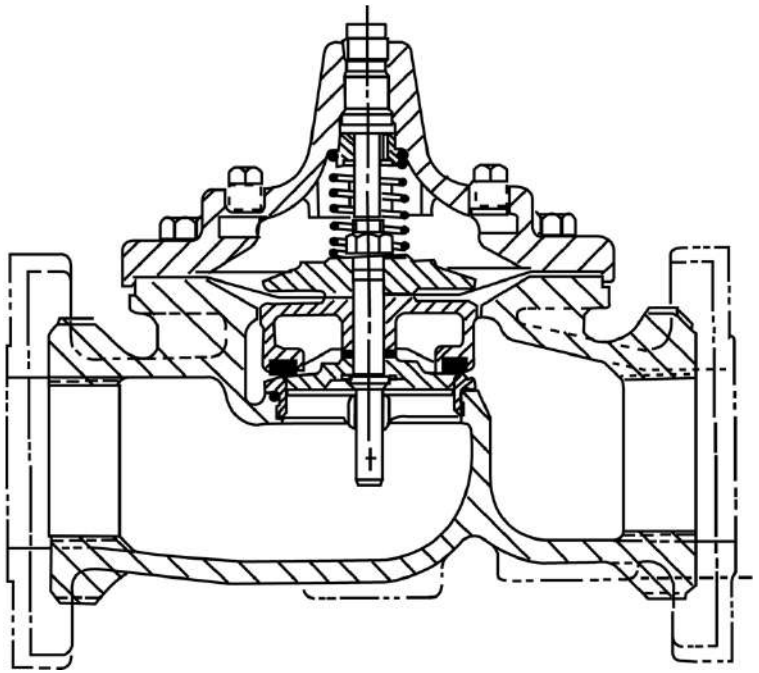

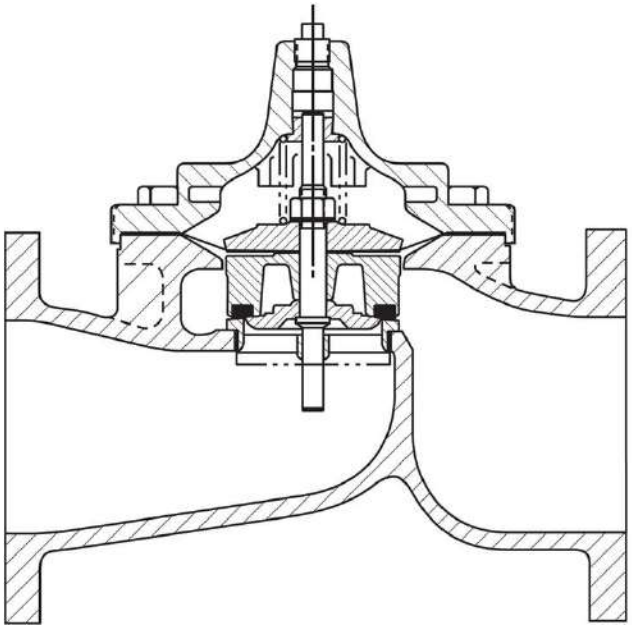

Model 100-01

Model 100-20

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To the largest: 48 inch

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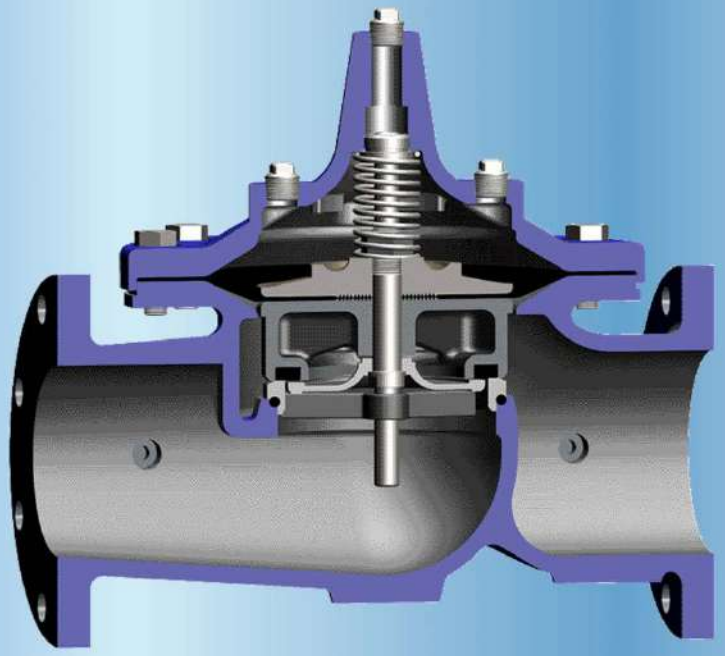
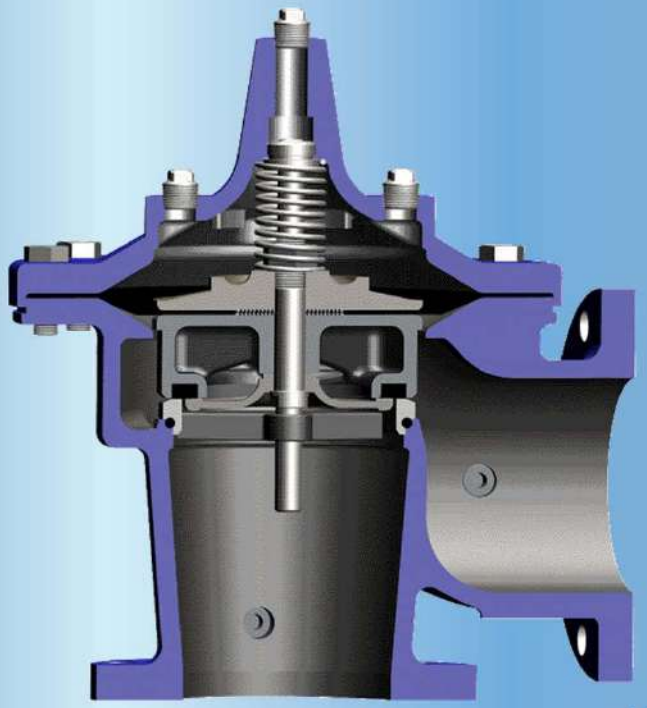
Globe and Angle Pattern





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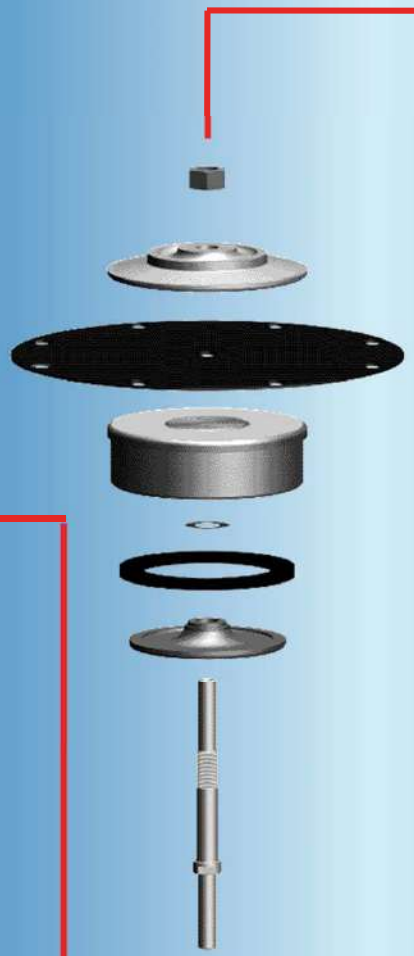
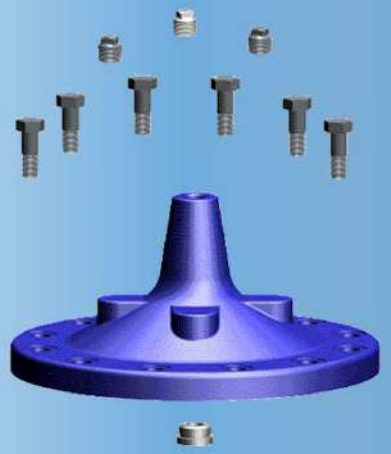
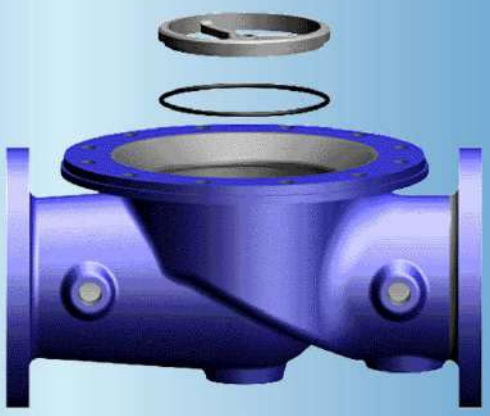
Three Simple Assemblies



Diaphragm & Disc Assembly



Cover & Bearing Assembly



Valve Body & Seat Assembly

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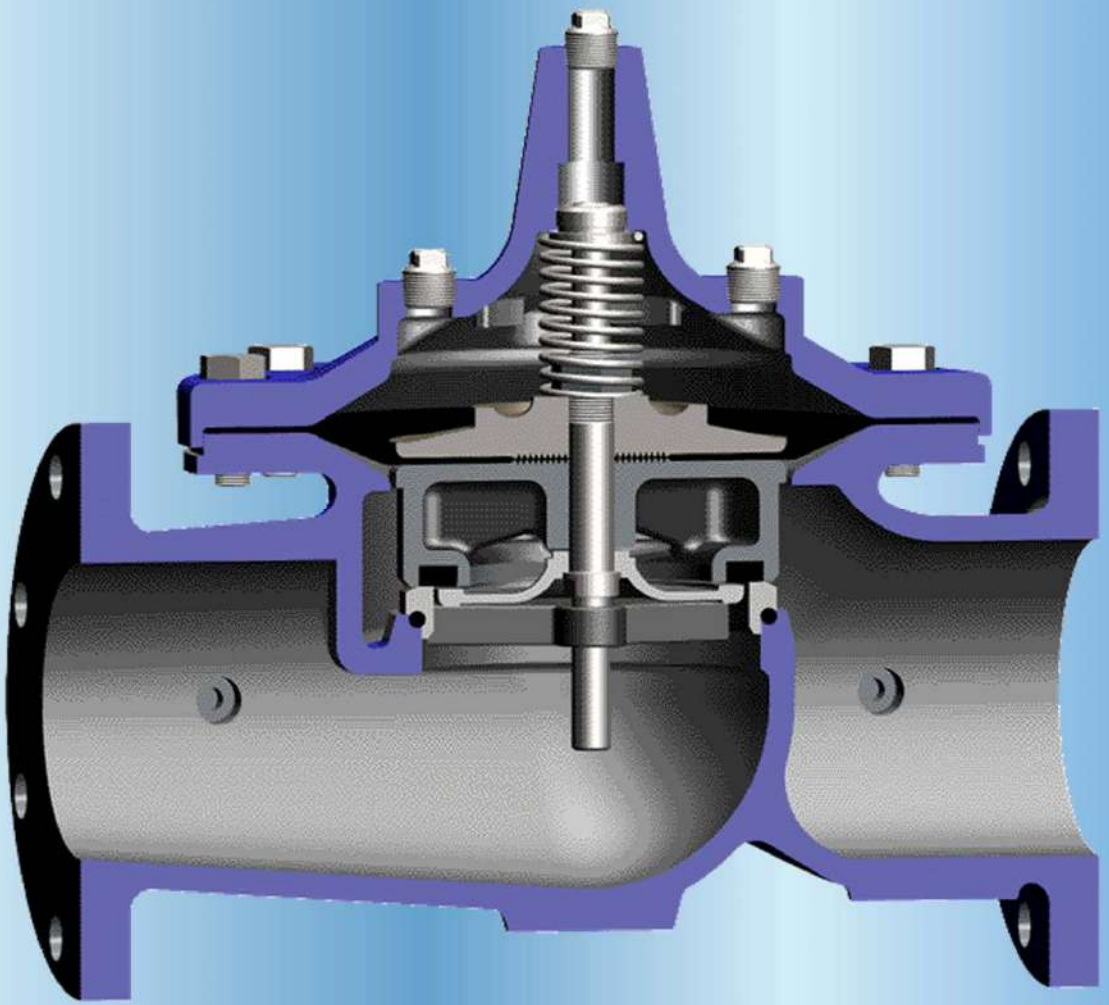
A Look Inside the Hytrol



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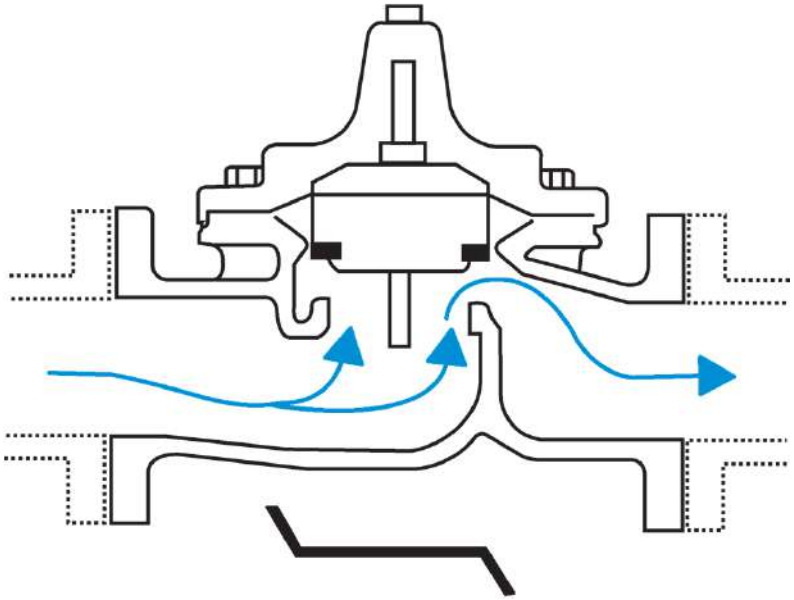
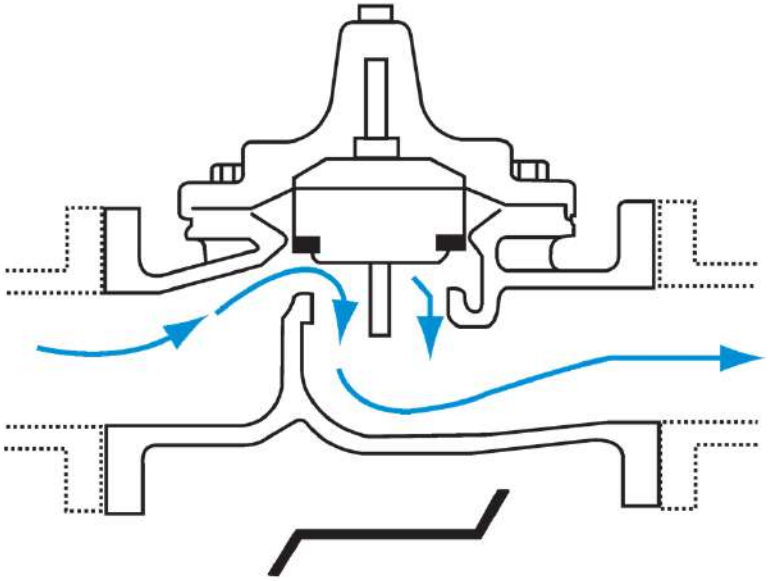
Flow Direction

Normal Flow



Up and Over Seat

Reverse Flow



Over Seat and Down

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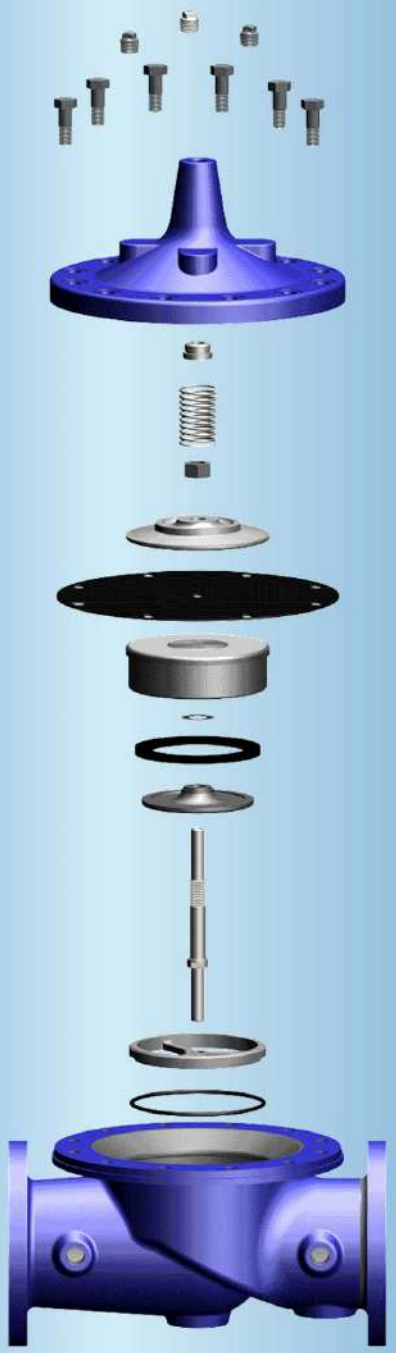

Hytrol Main Valve

- Simple Construction
- Easy to Service
- Fewest Parts

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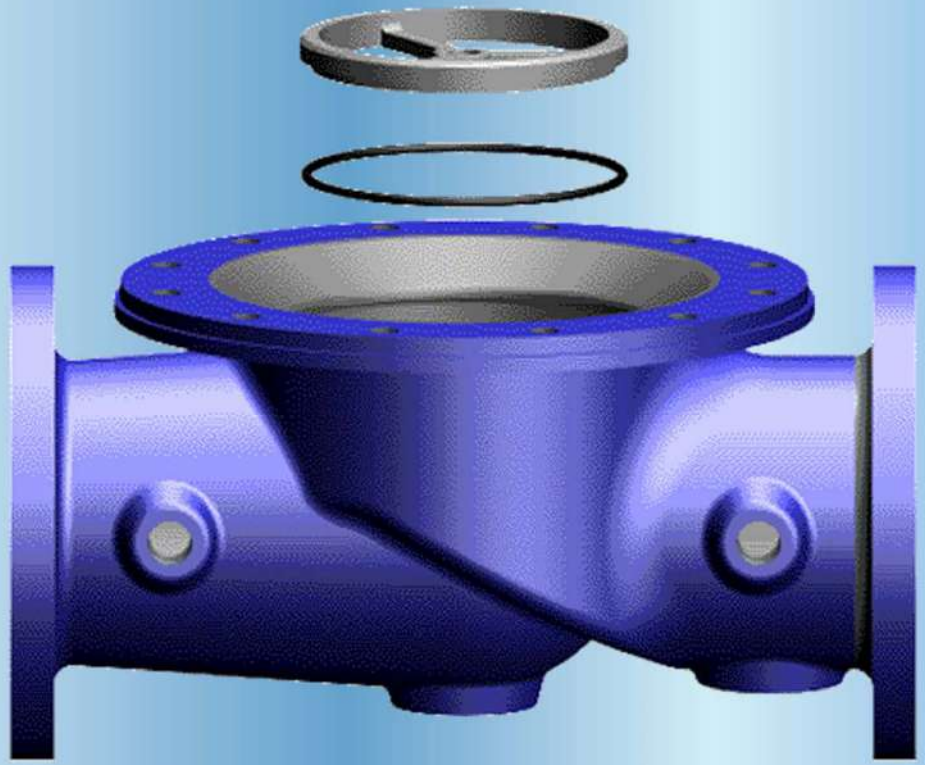
Body and Seat Assembly



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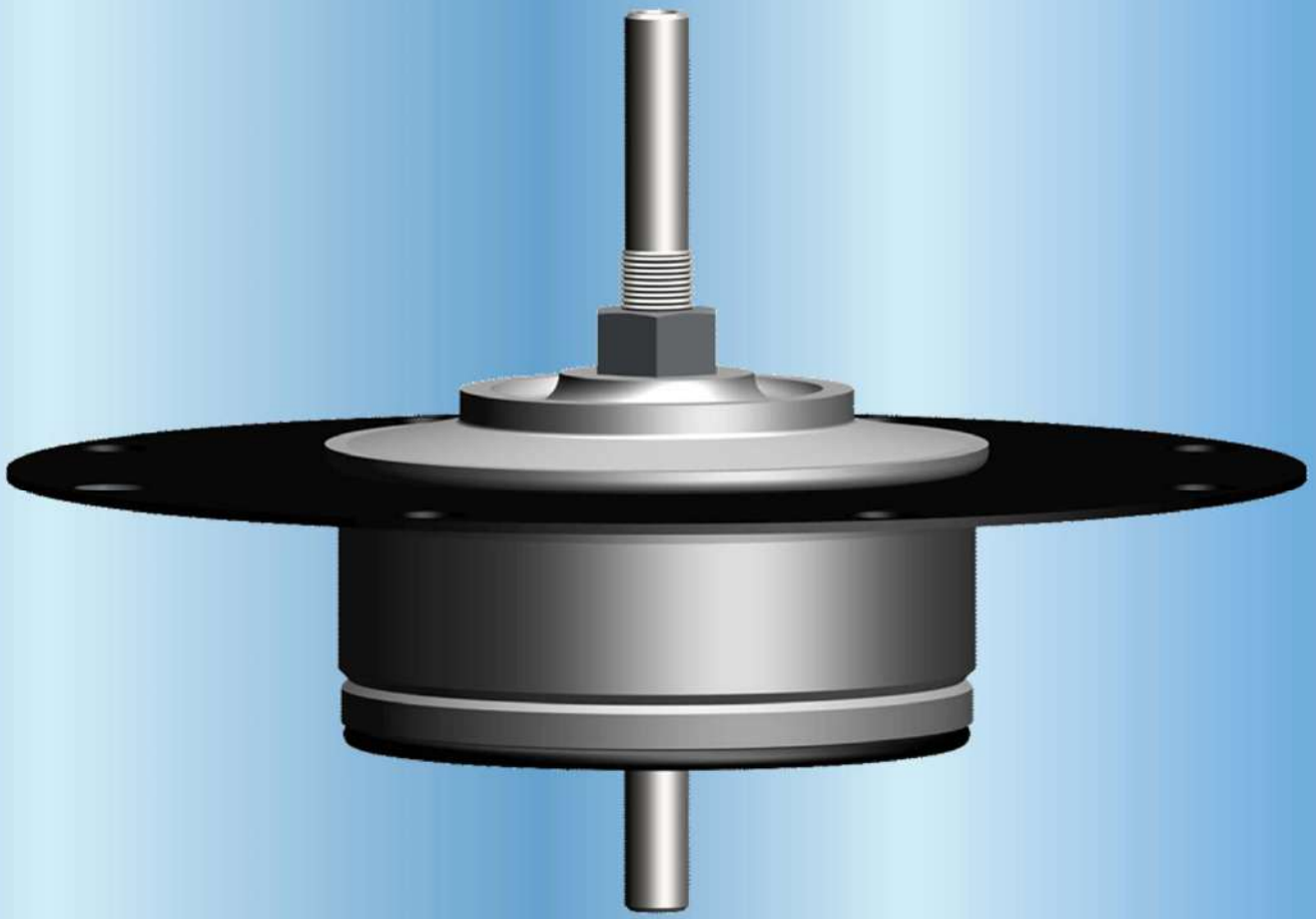
Complete Diaphragm and Disc Assembly



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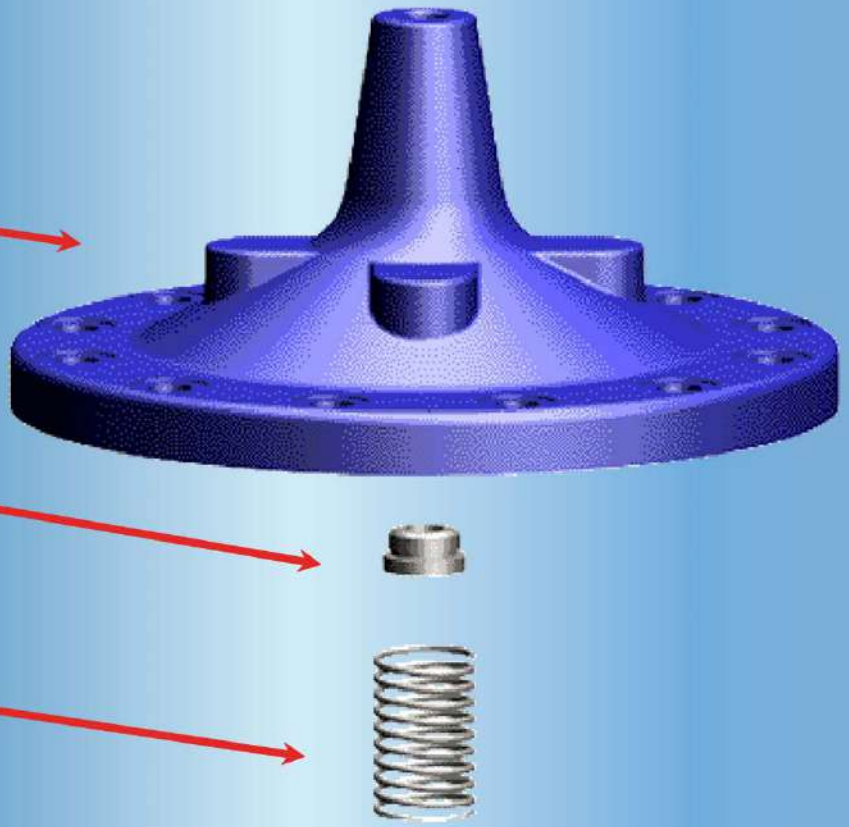
Cover and Spring Assembly

Cover

Cover Bearing

Spring



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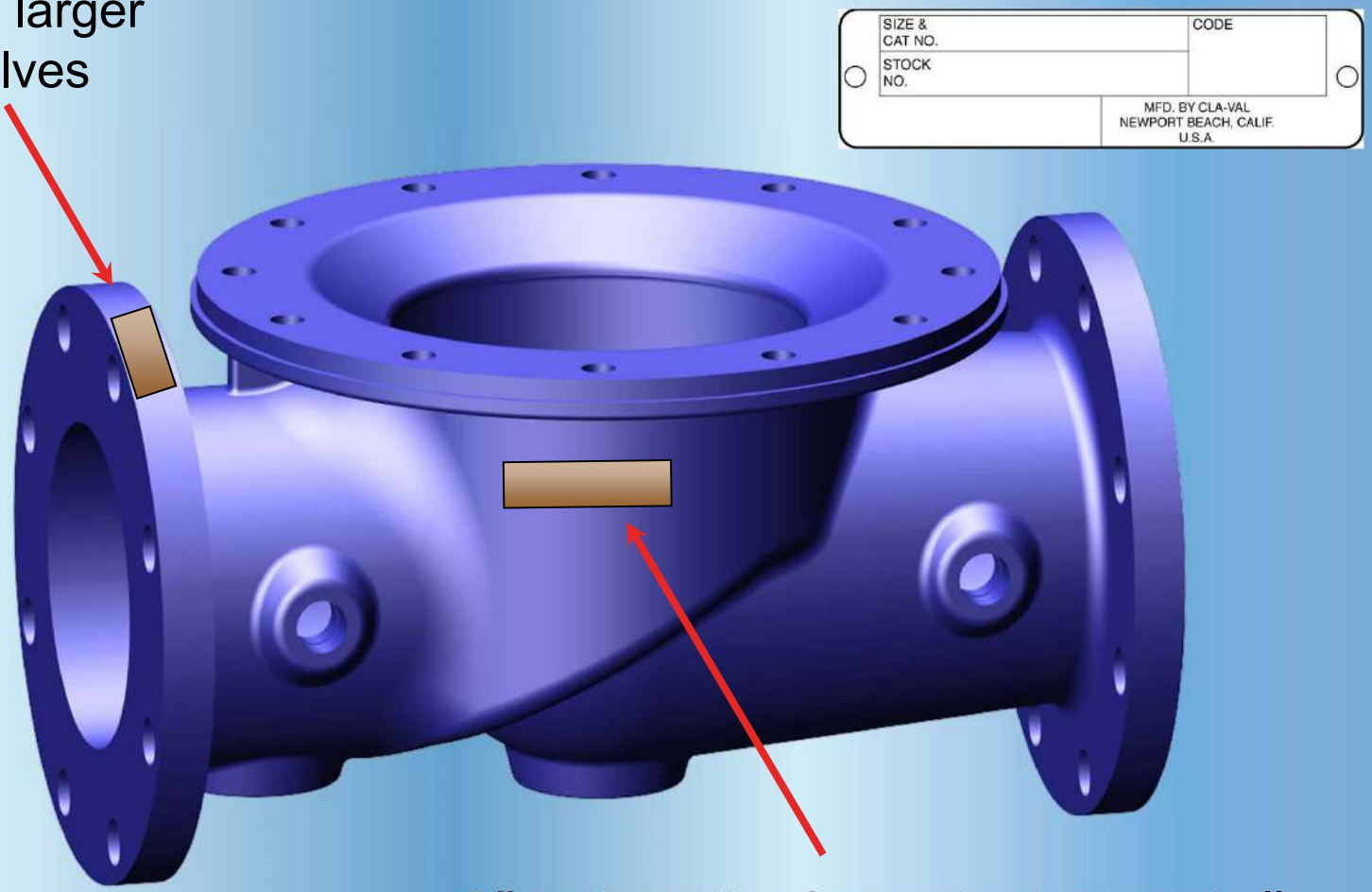
Name Plate Locations

2-1/2″ and larger flanged valves



2″ and smaller flanged valves and all threaded and grooved valves

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Cla-Val Nameplate

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Renewable Seat

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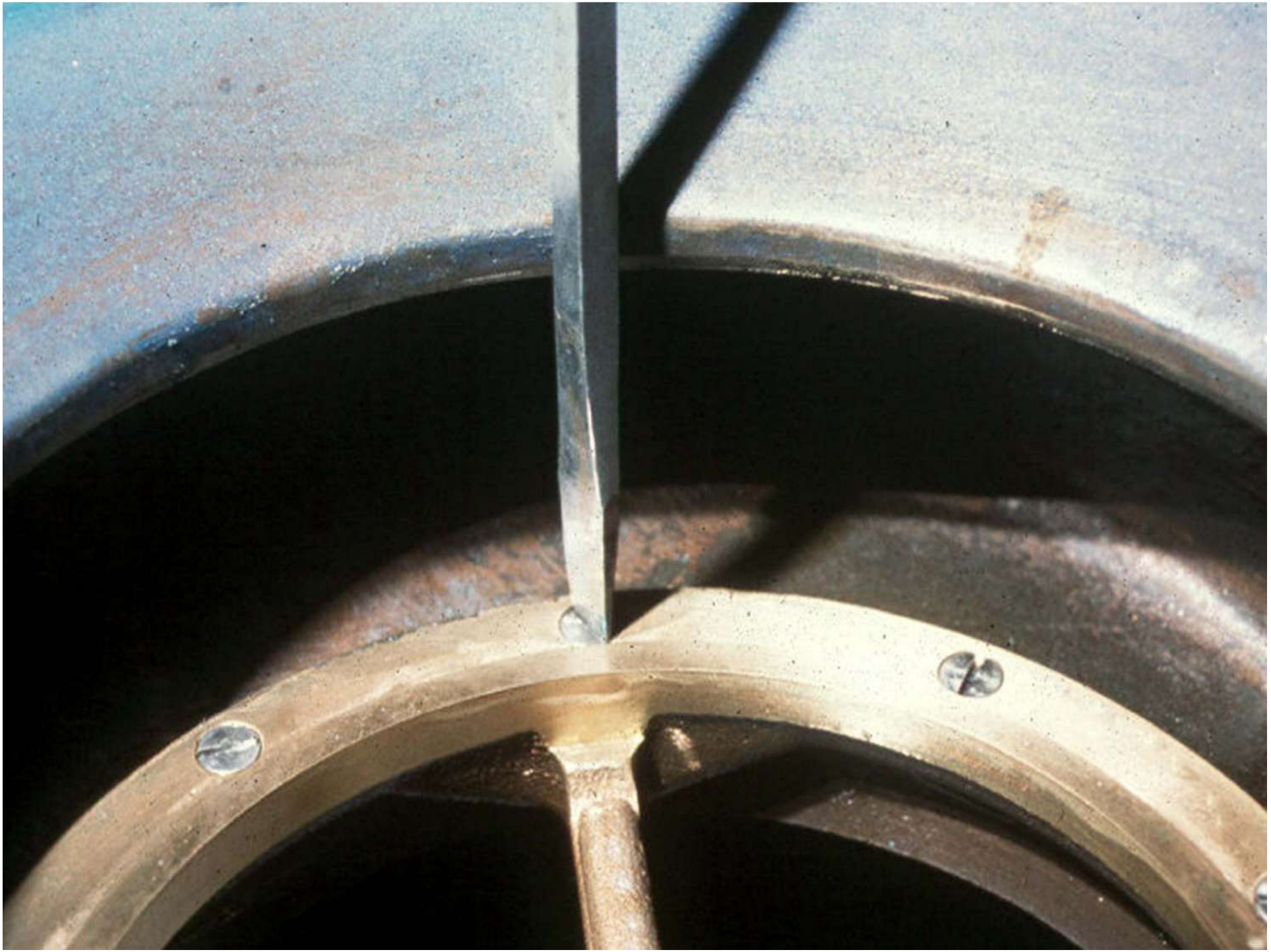

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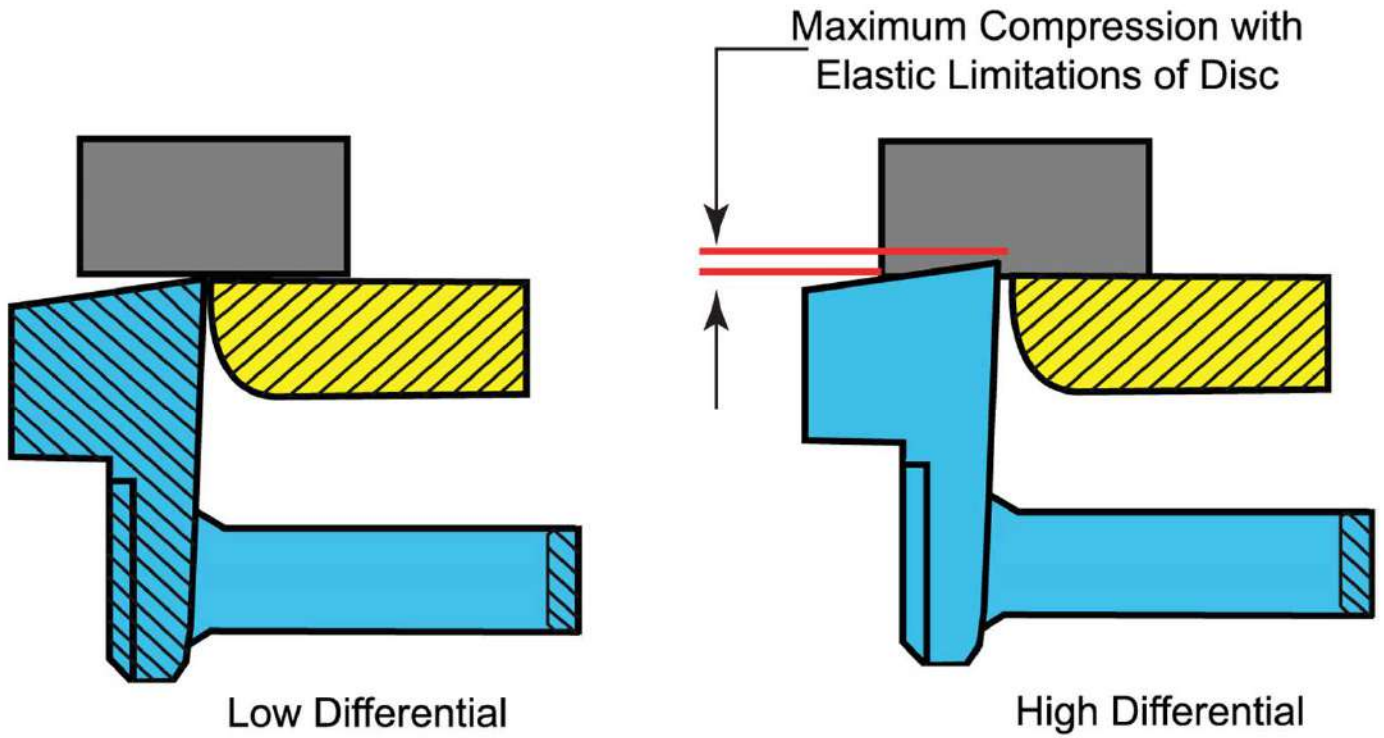
Drip Tight Sealing



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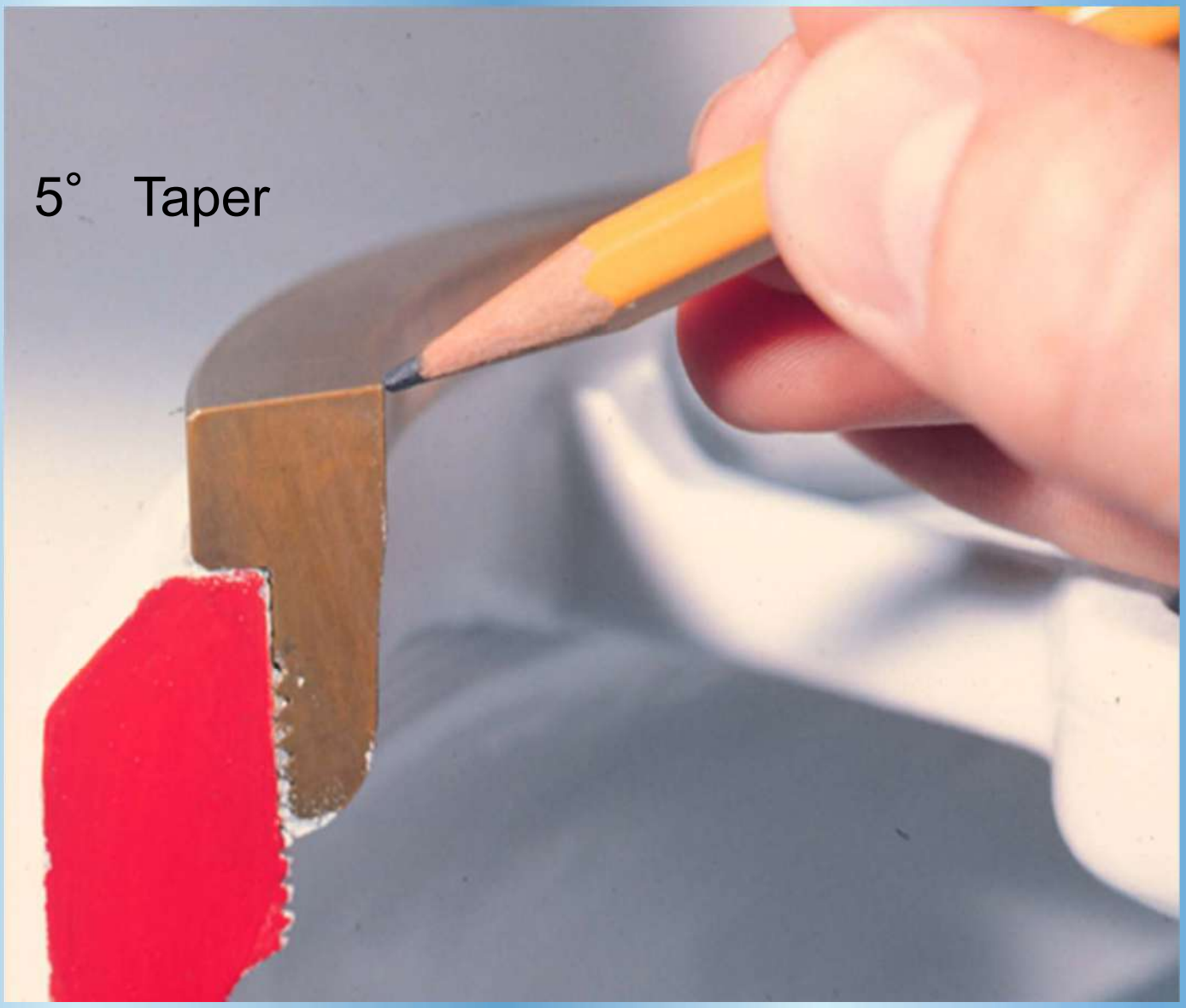
Seat Design Features



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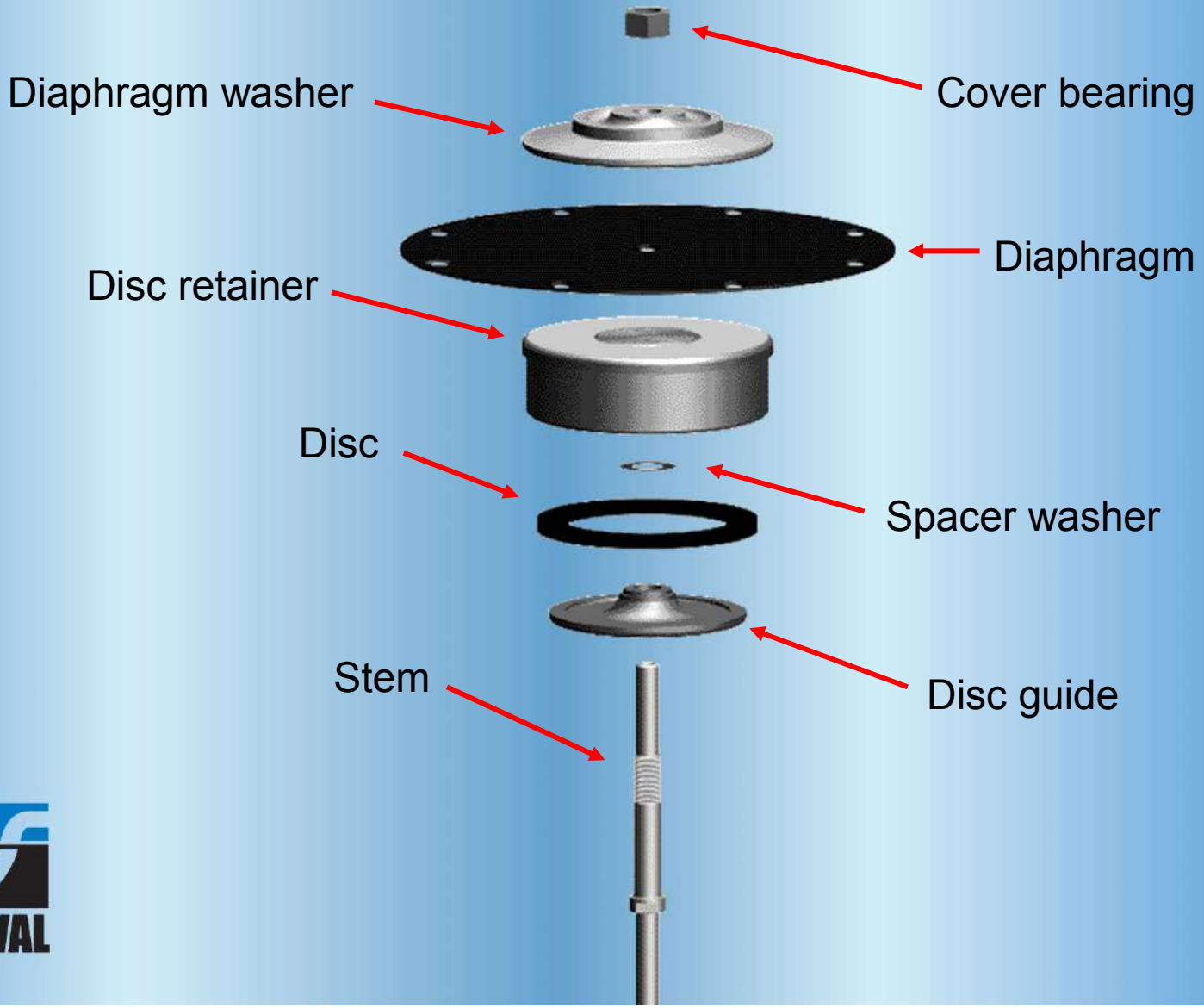
Diaphragm and Disc Assembly



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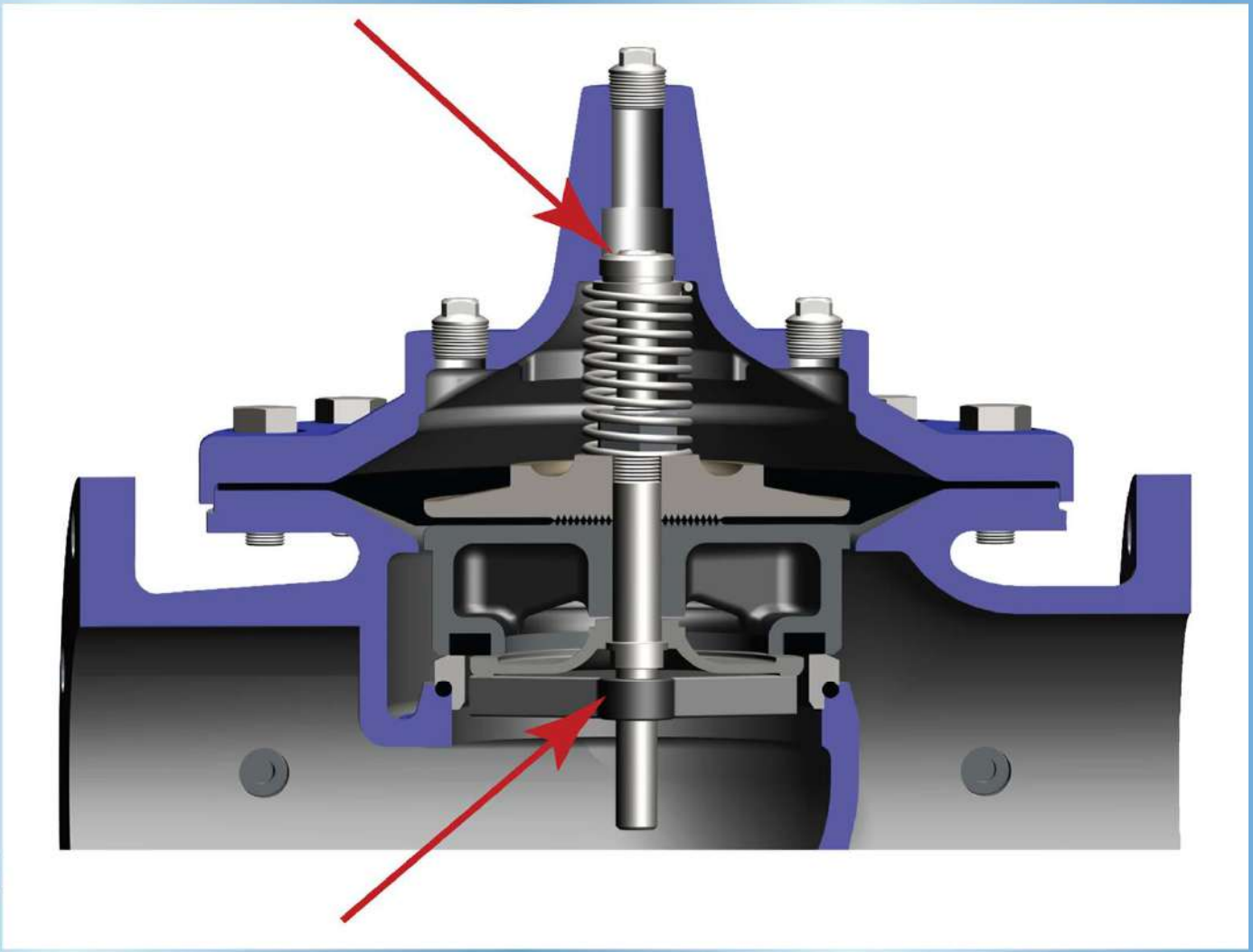
Top and Bottom Guided Stem



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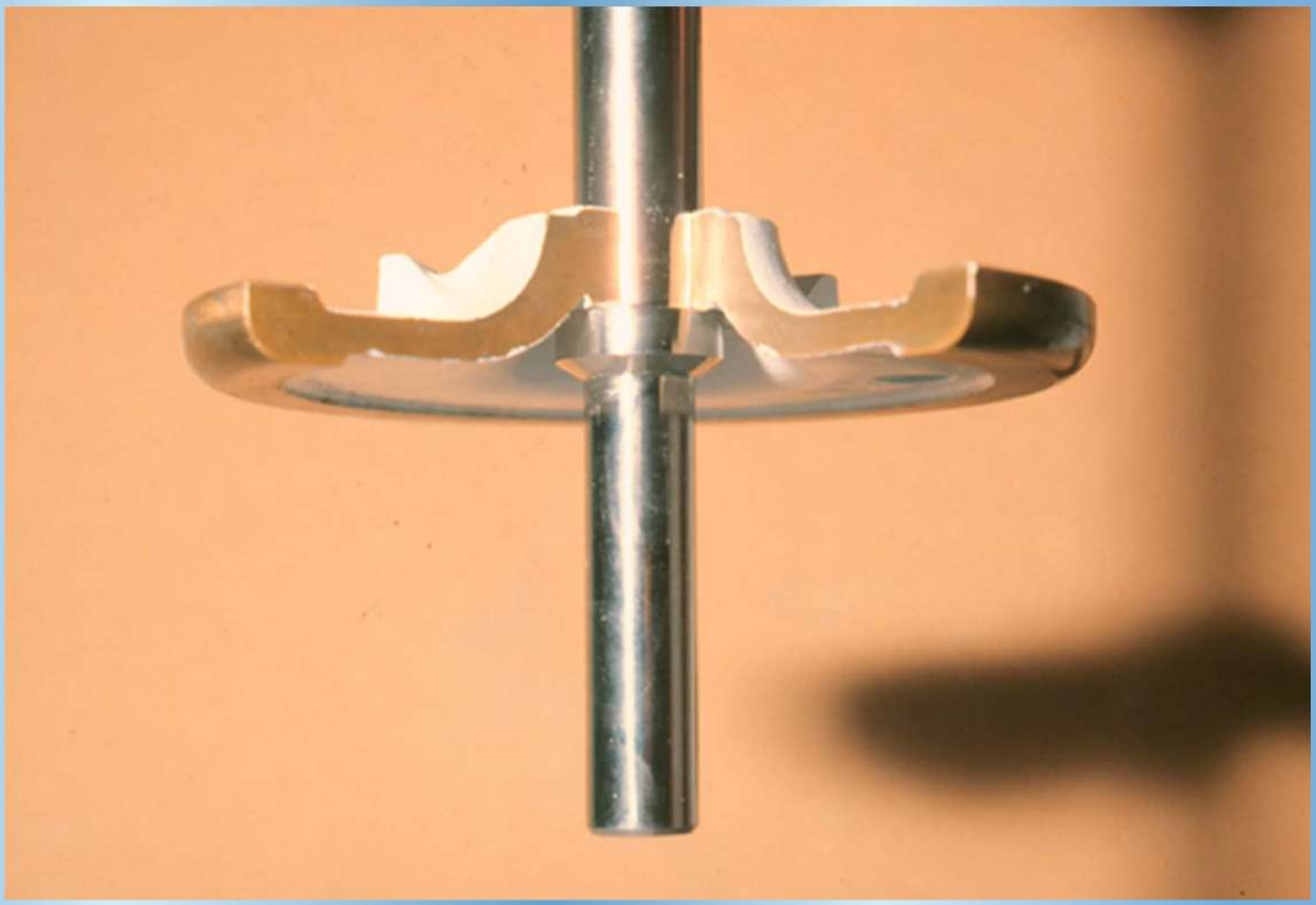
Disc Guide



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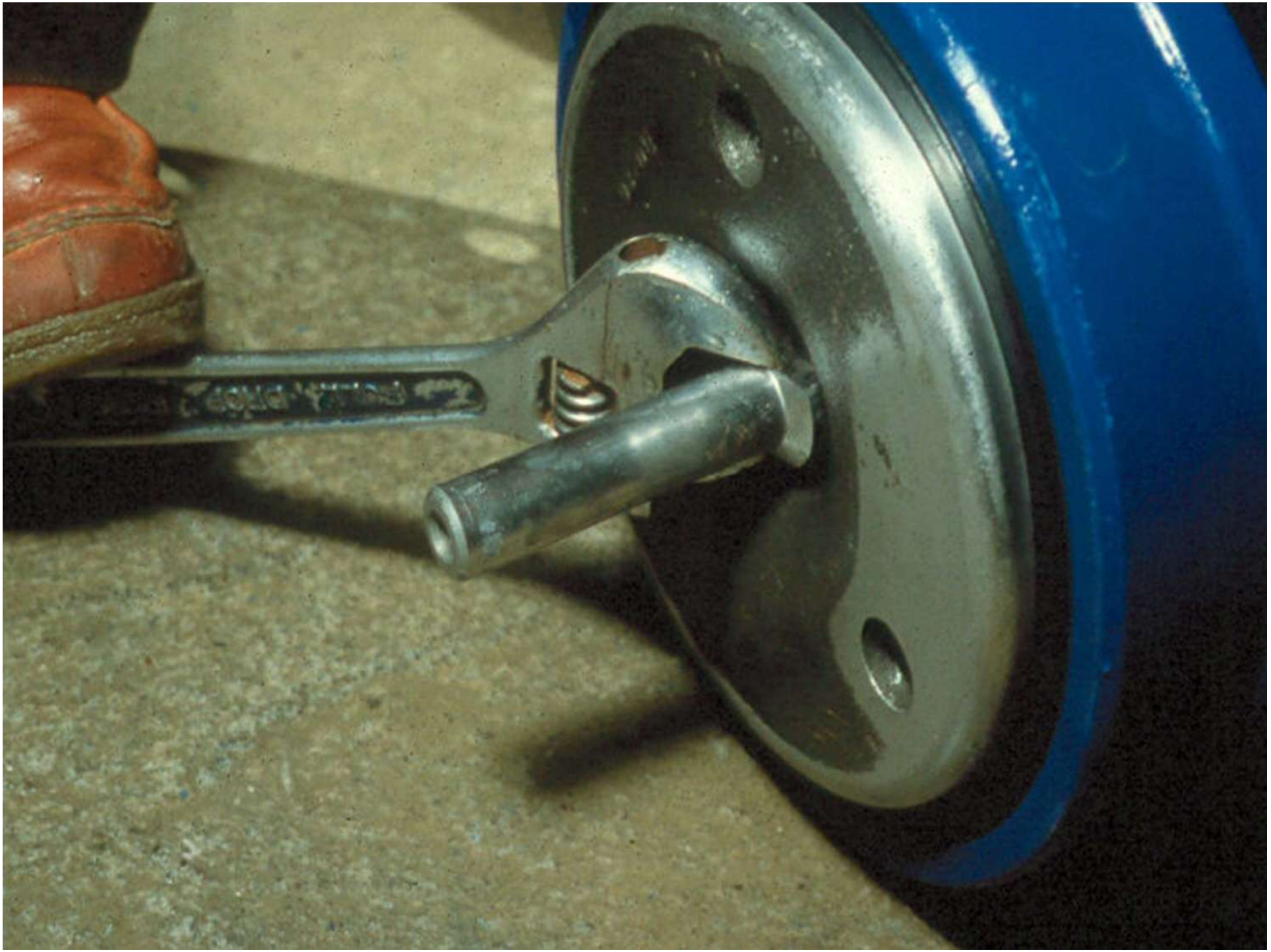

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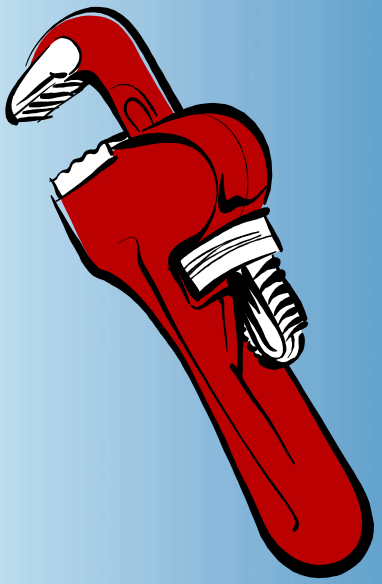
Valve Stem

No wrenches!

Use “soft jaws”



Bearing Surface

Bearing Surface

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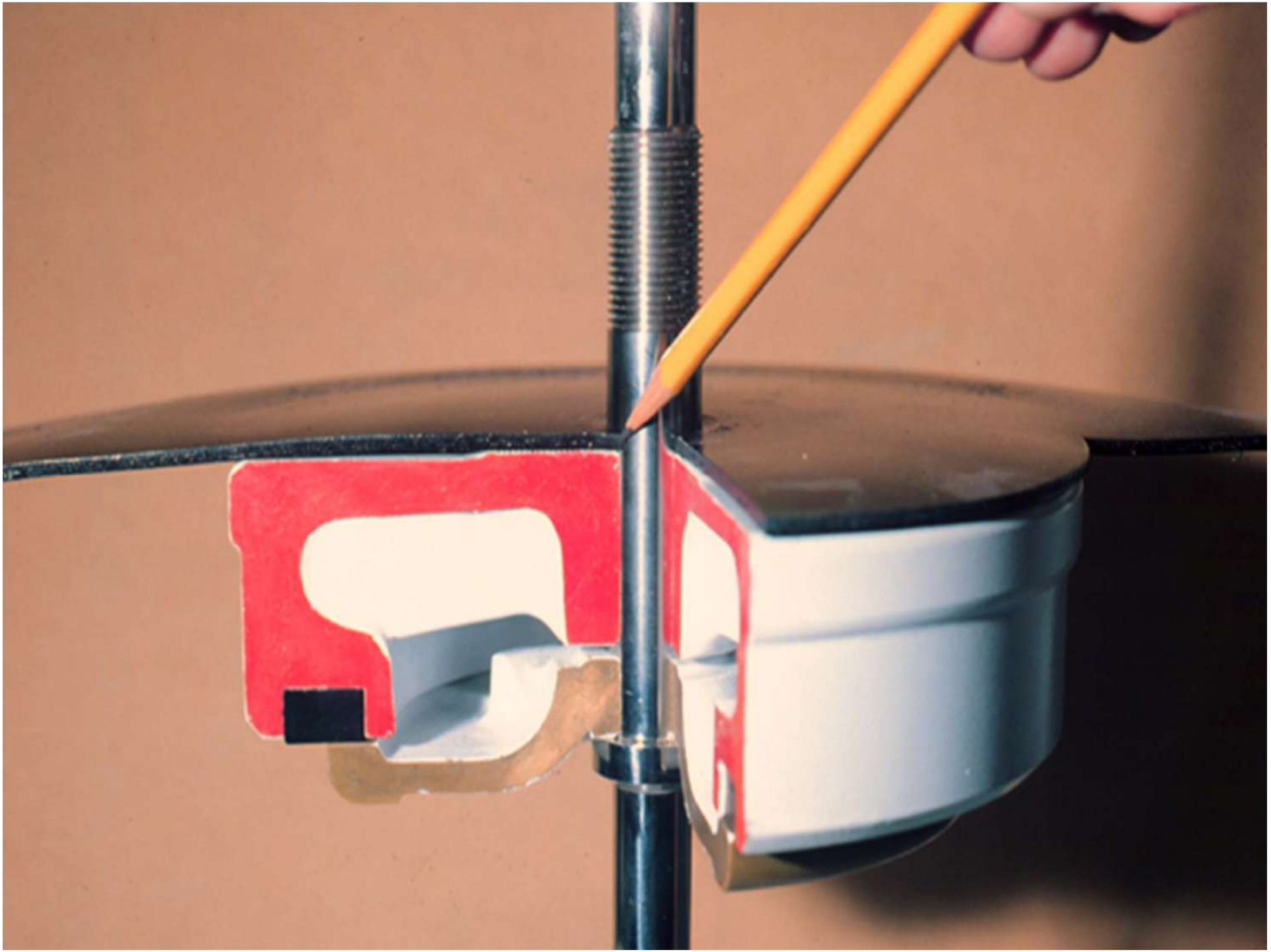

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Date Stamp

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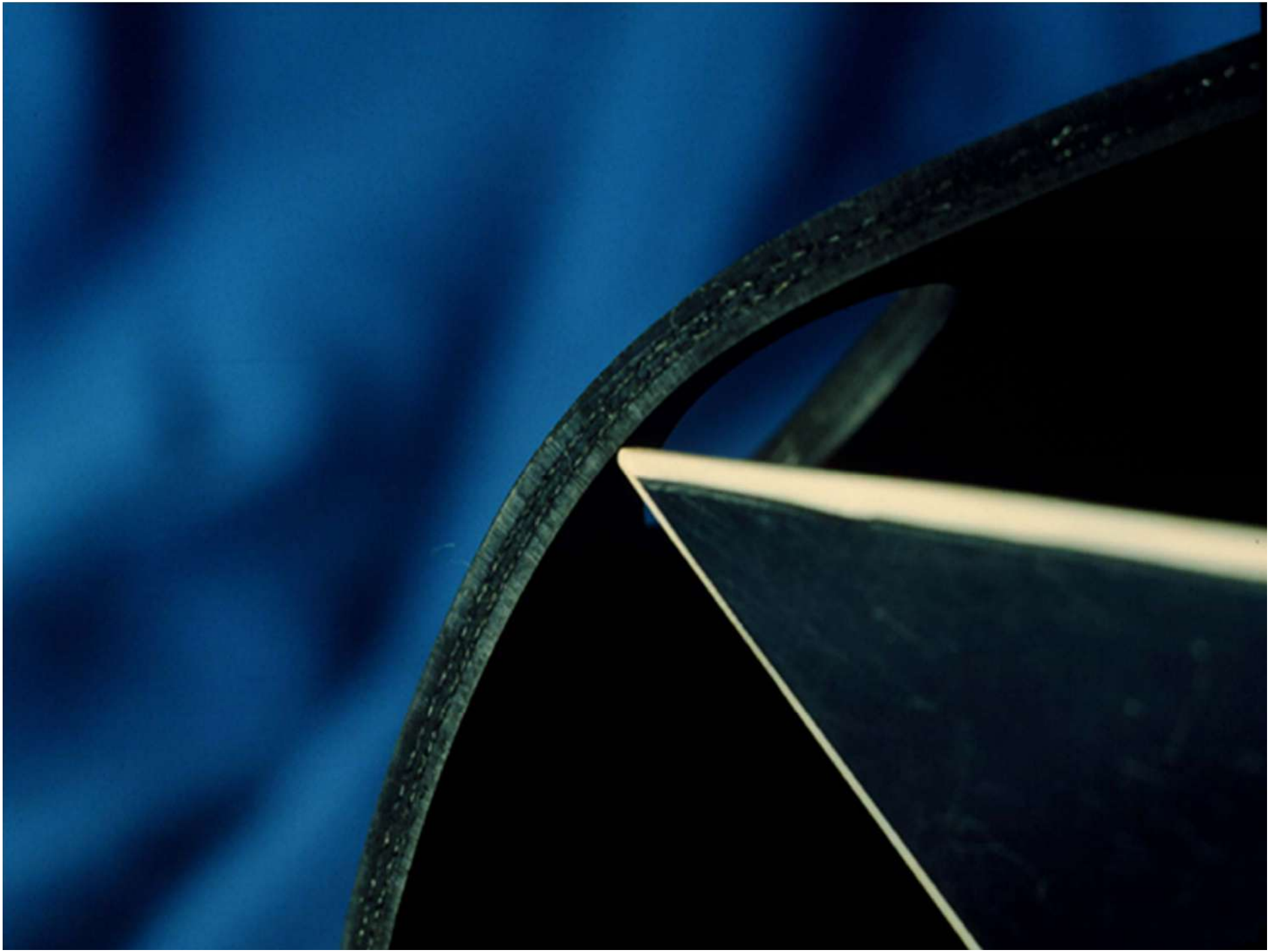

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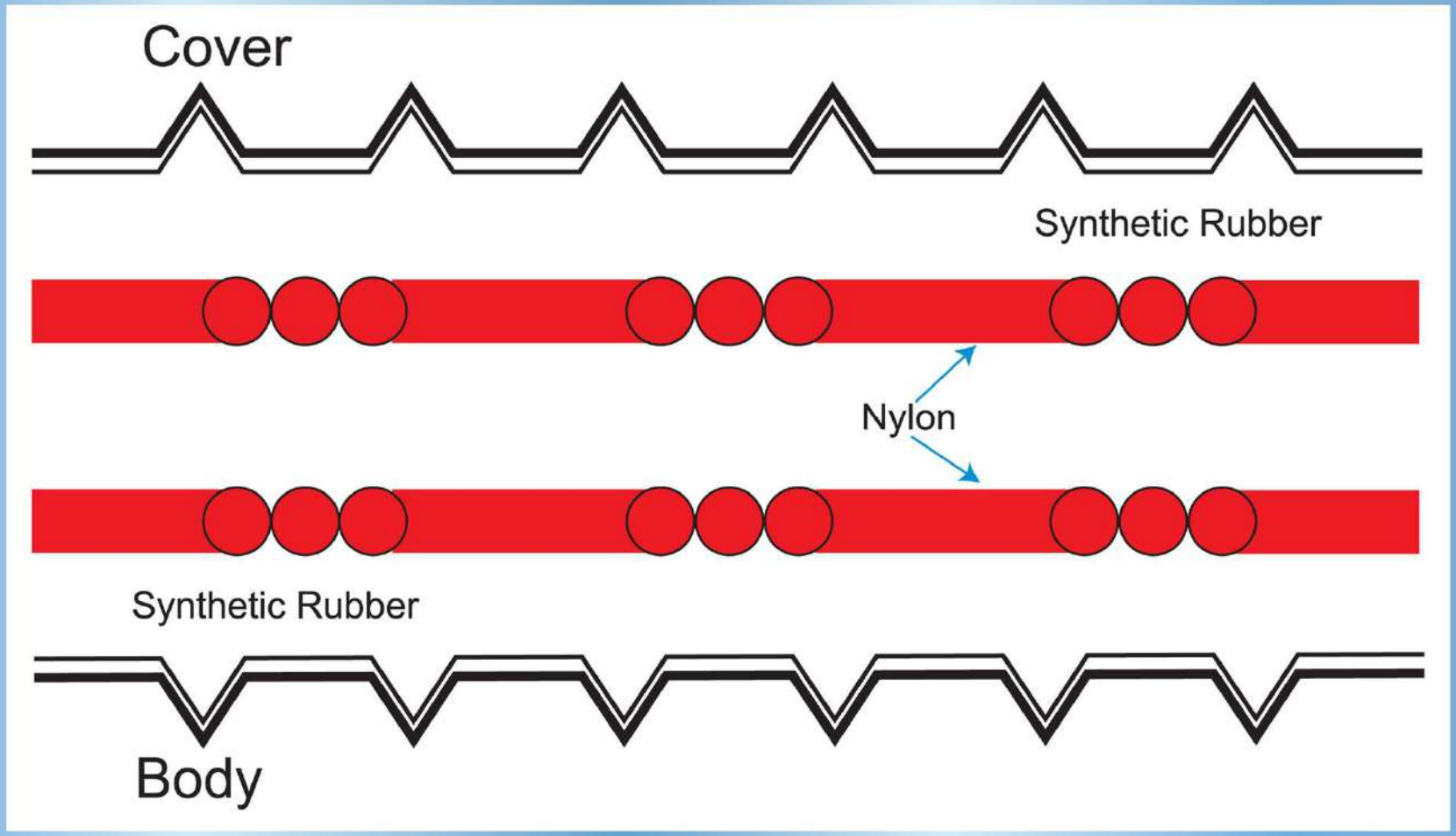
Diaphragm Gripping



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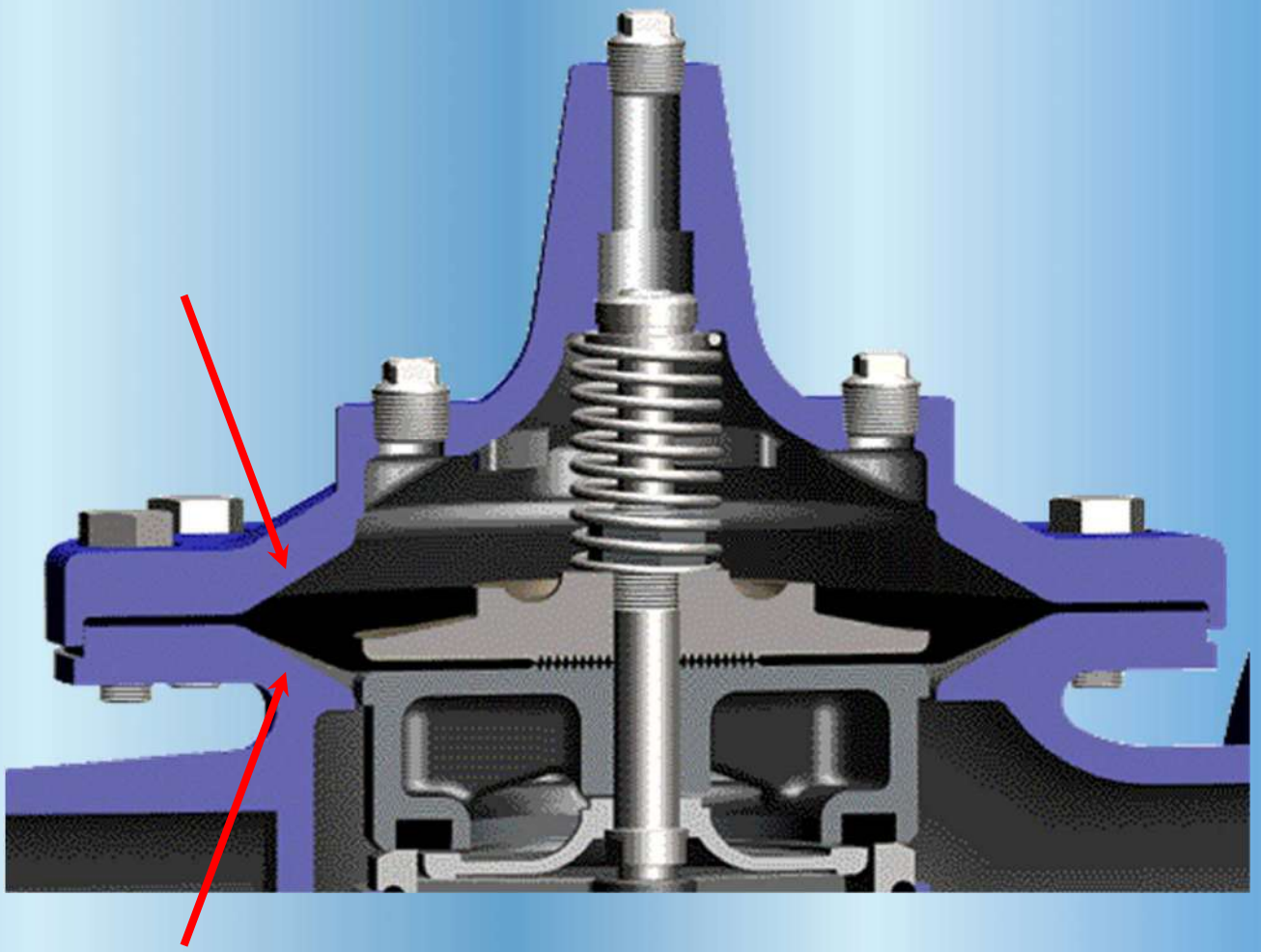
Fully Supported Diaphragm



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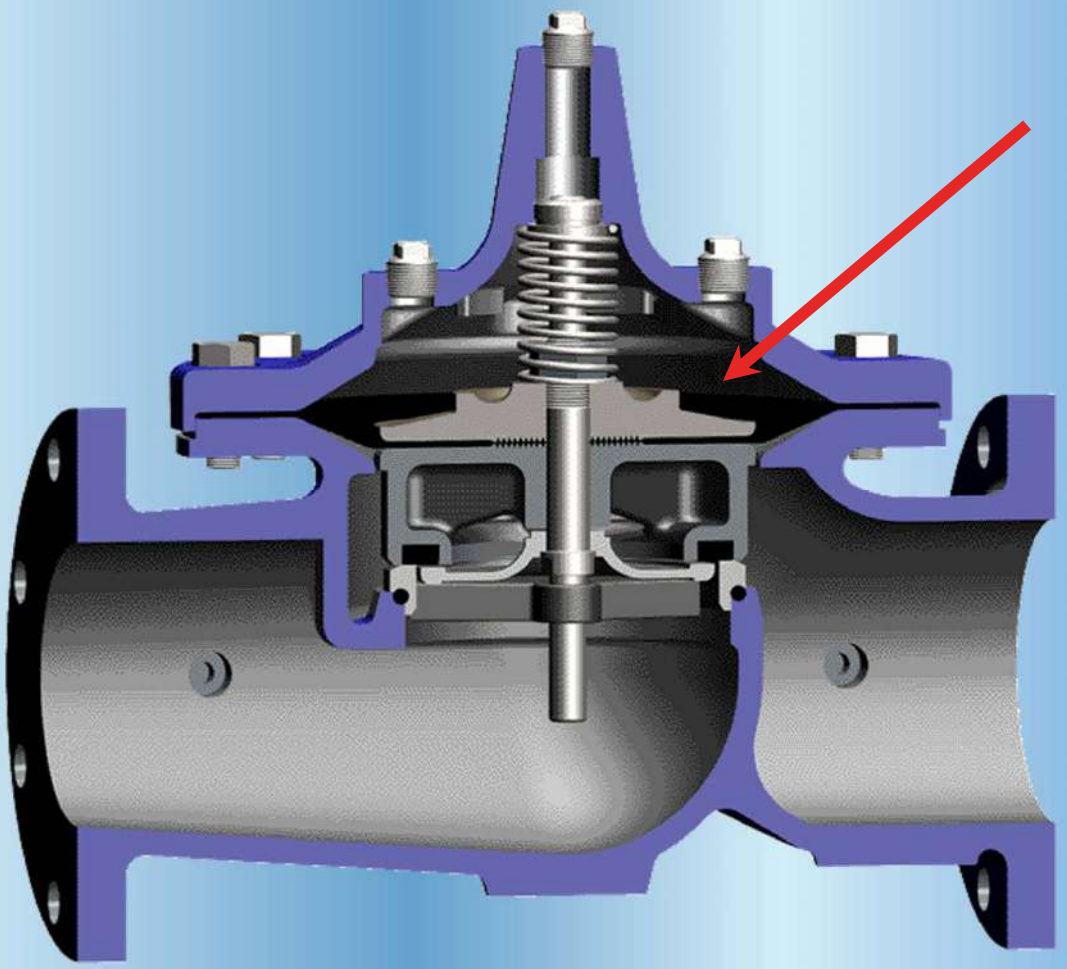
Cover Chamber



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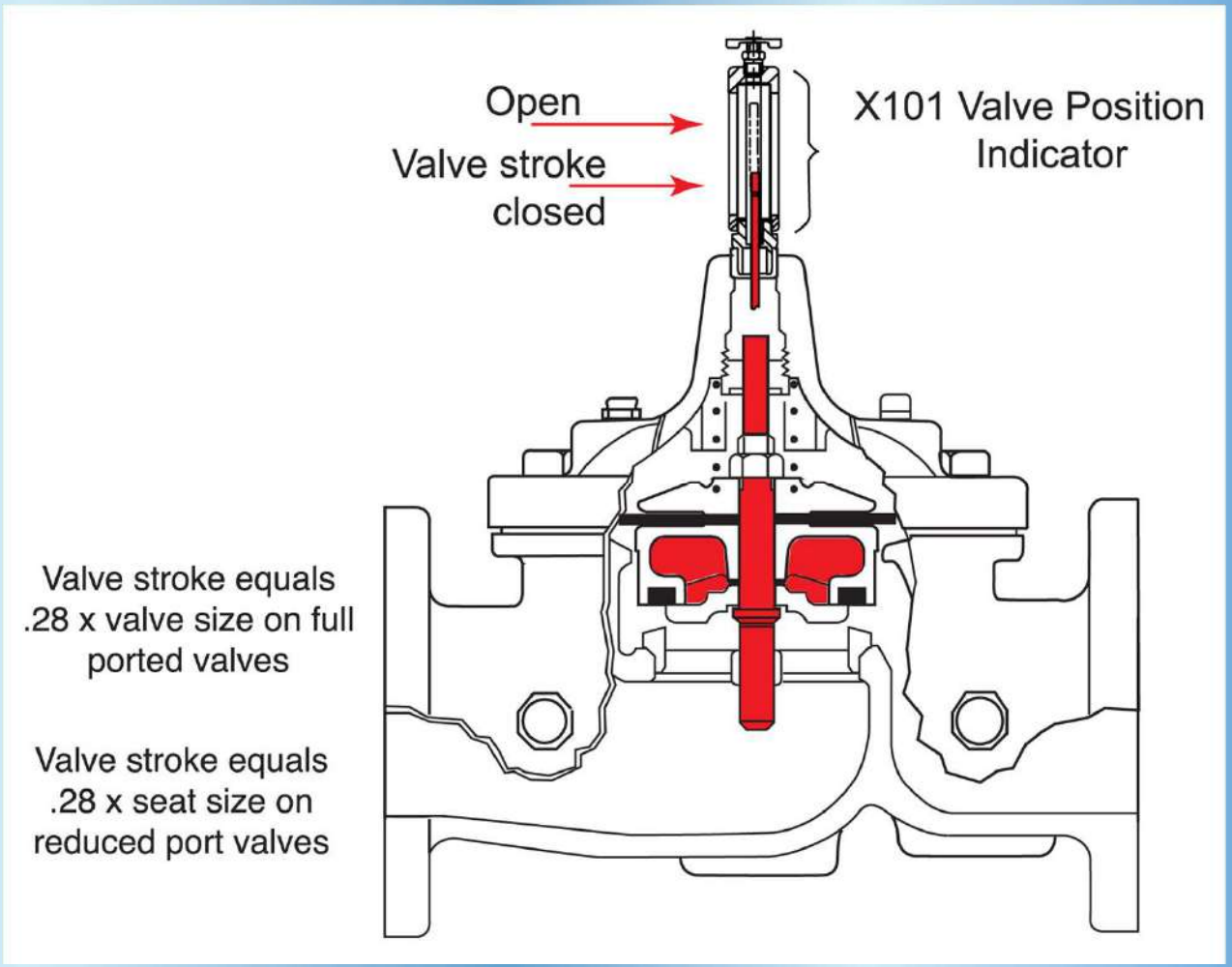
Measured Stroke



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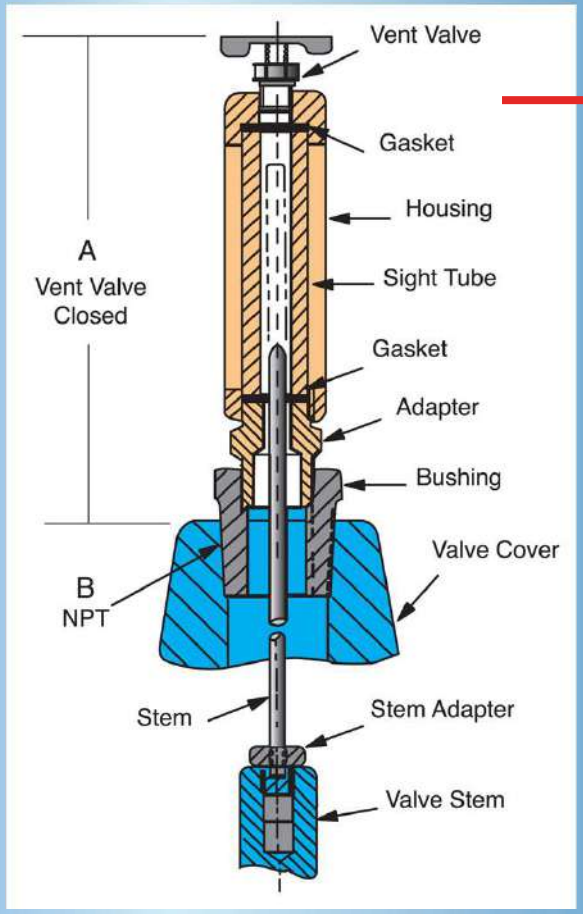
X101 Valve Position Indicator



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Cla-Val Pilot Controls

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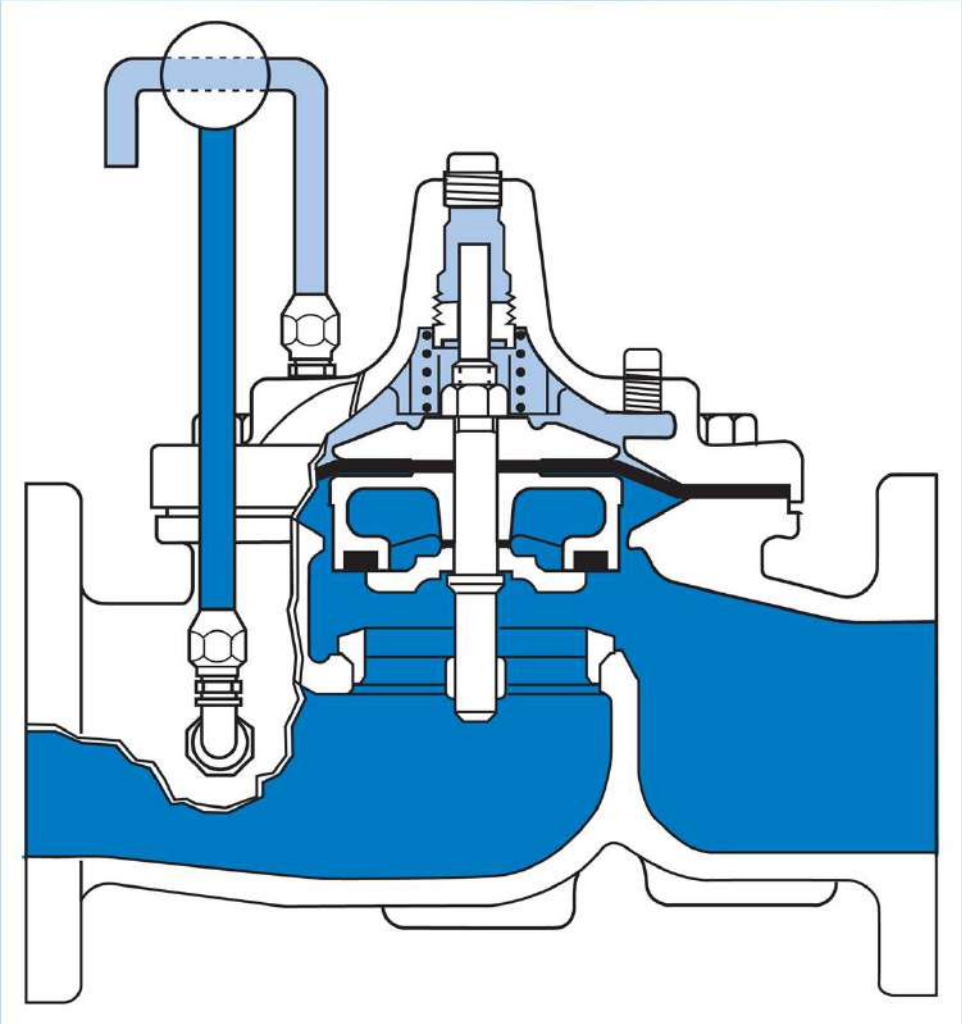
Open with 3-Way Pilot



- Non-Modulating

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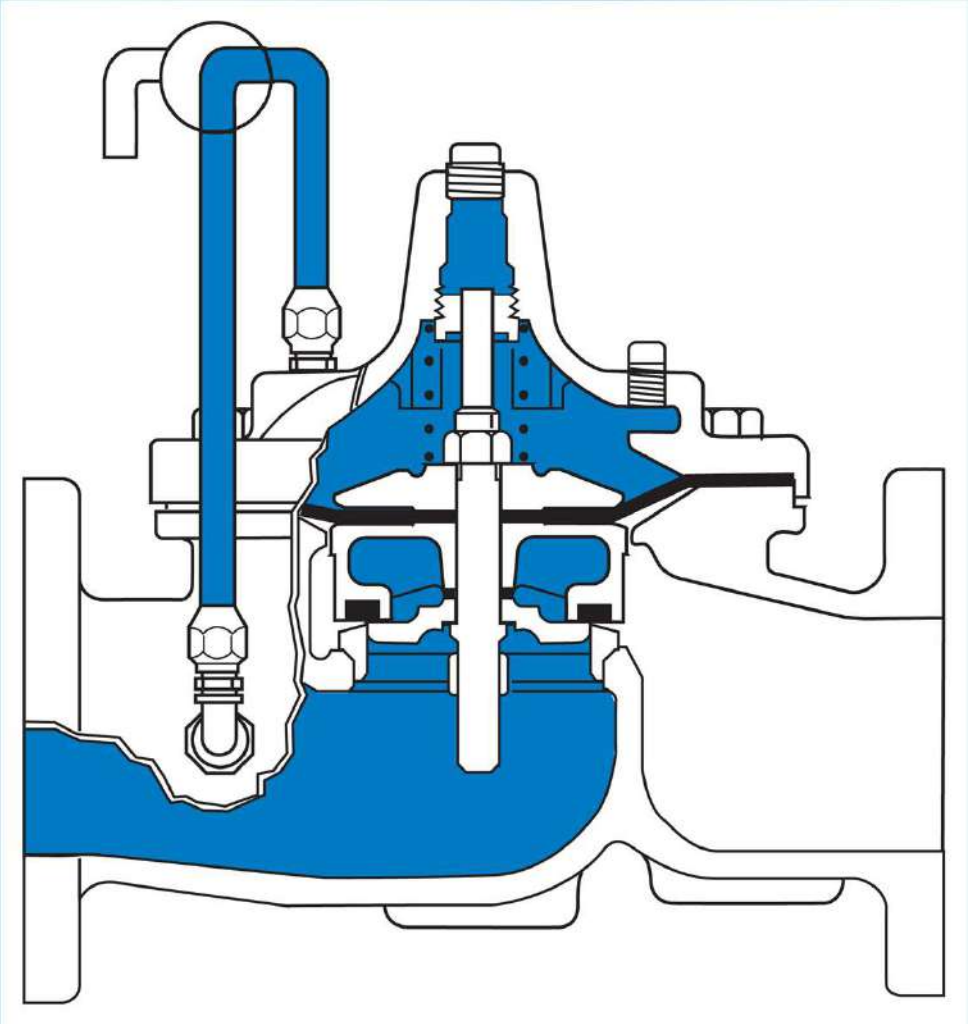
Closed with 3-Way Pilot



- Non-Modulating

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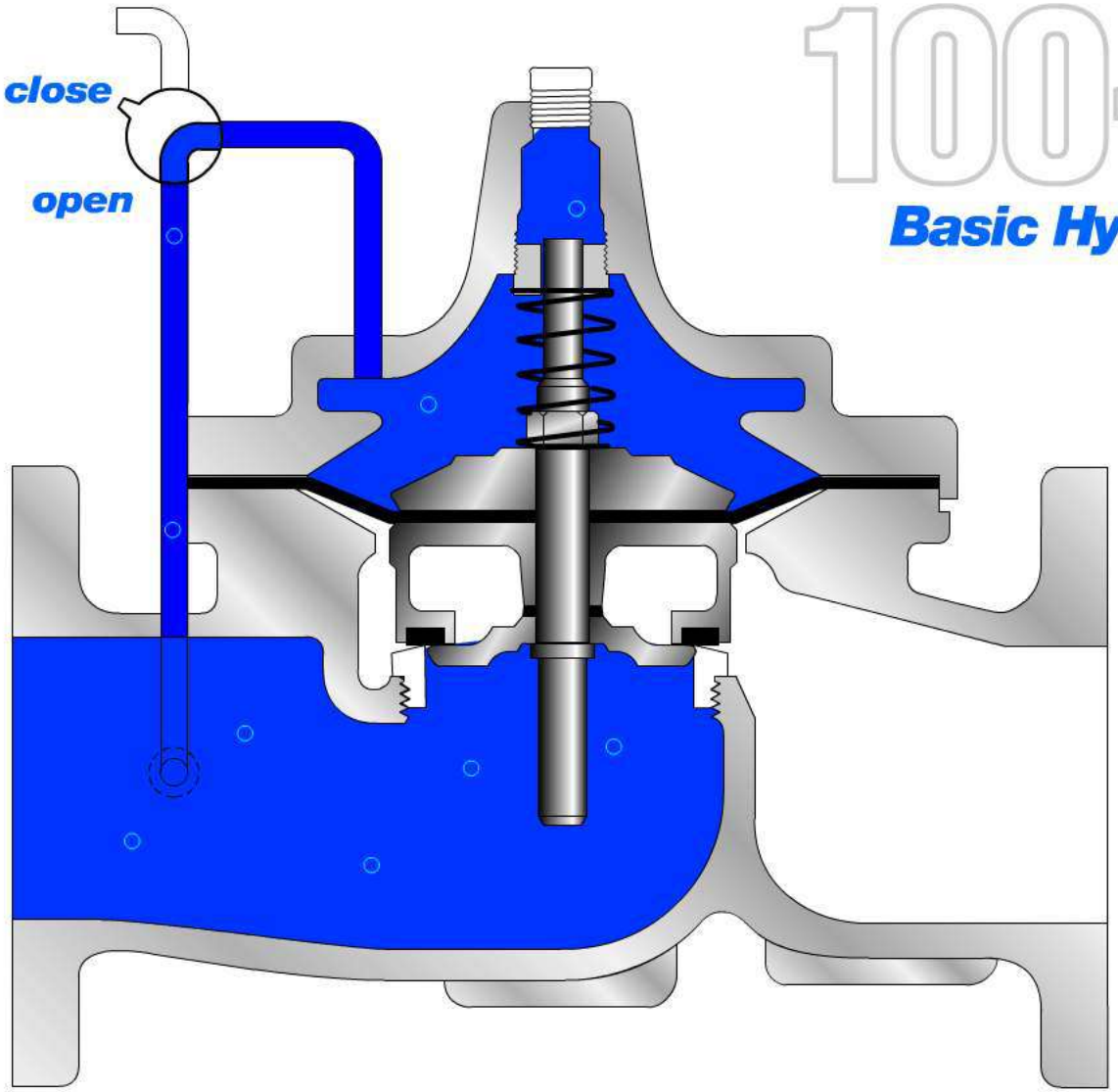
Close Valve

Open Valve



100-01

Basic Hytrol Valve

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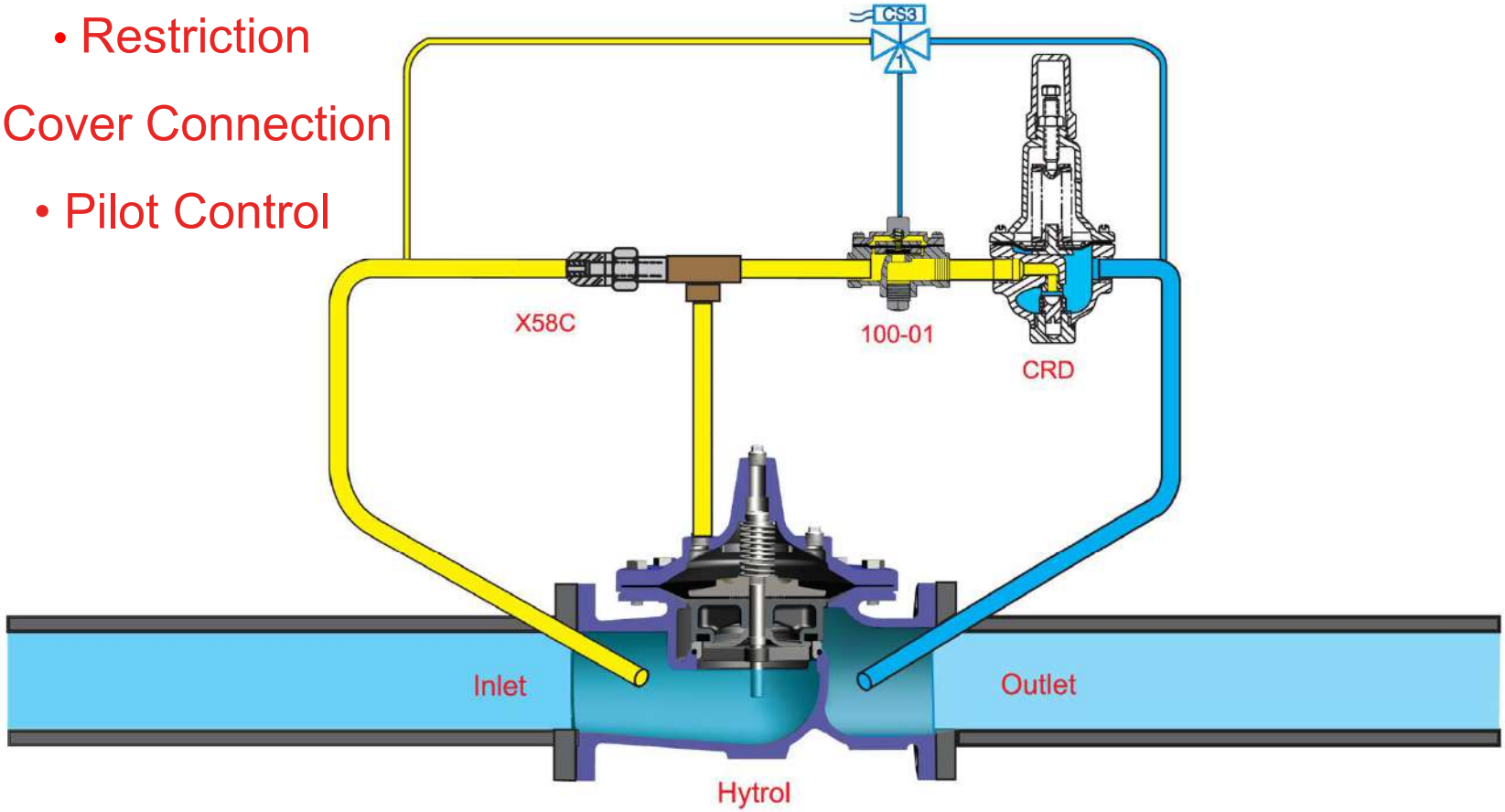
A Modulating Pilot System Has…

- Restriction
- Cover Connection
- Pilot Control



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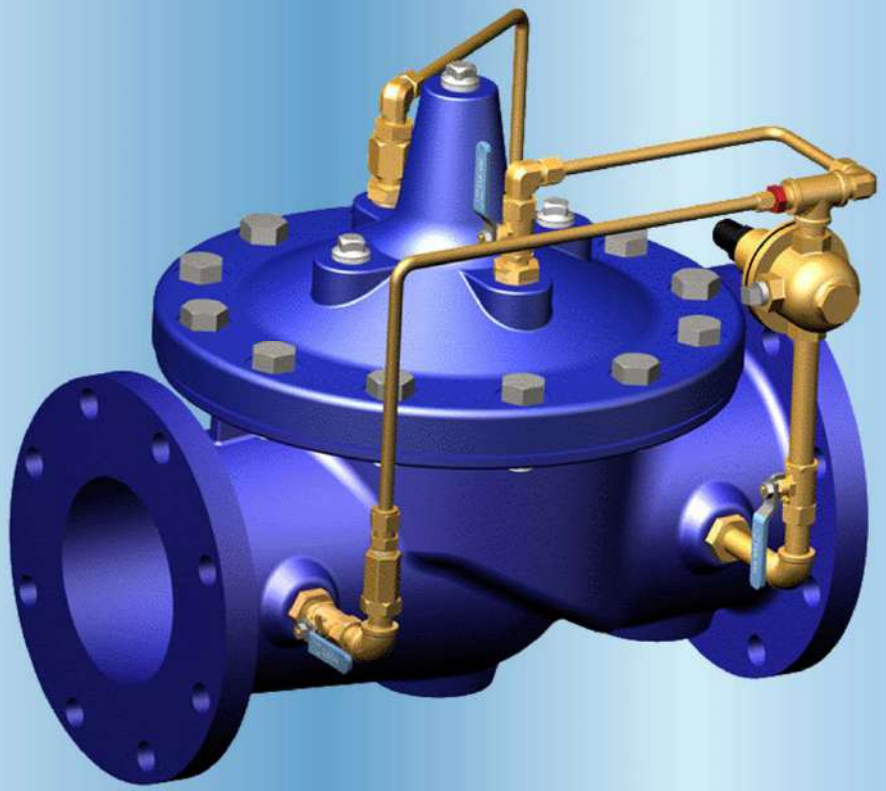
Pressure Reducing Valves



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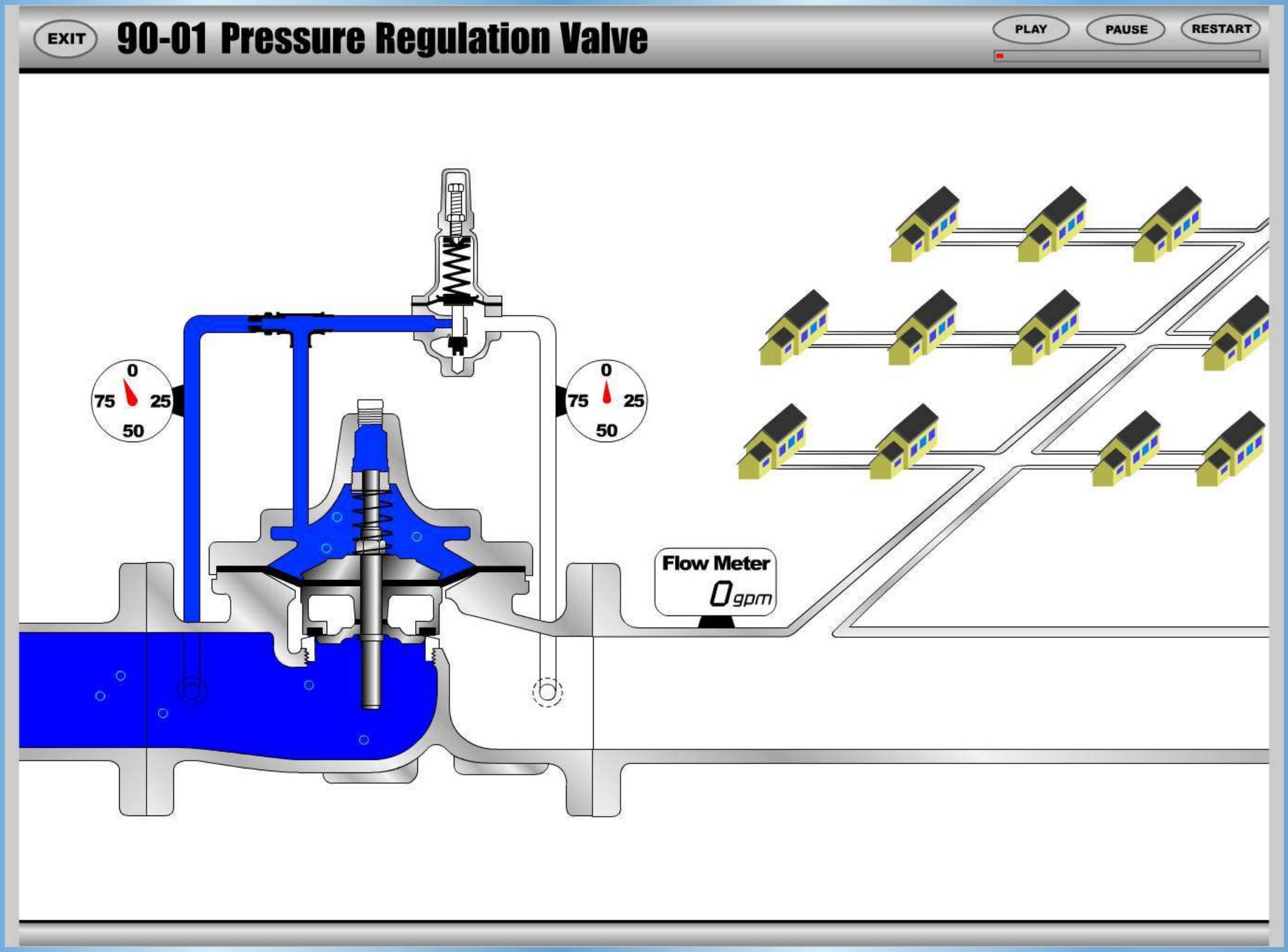

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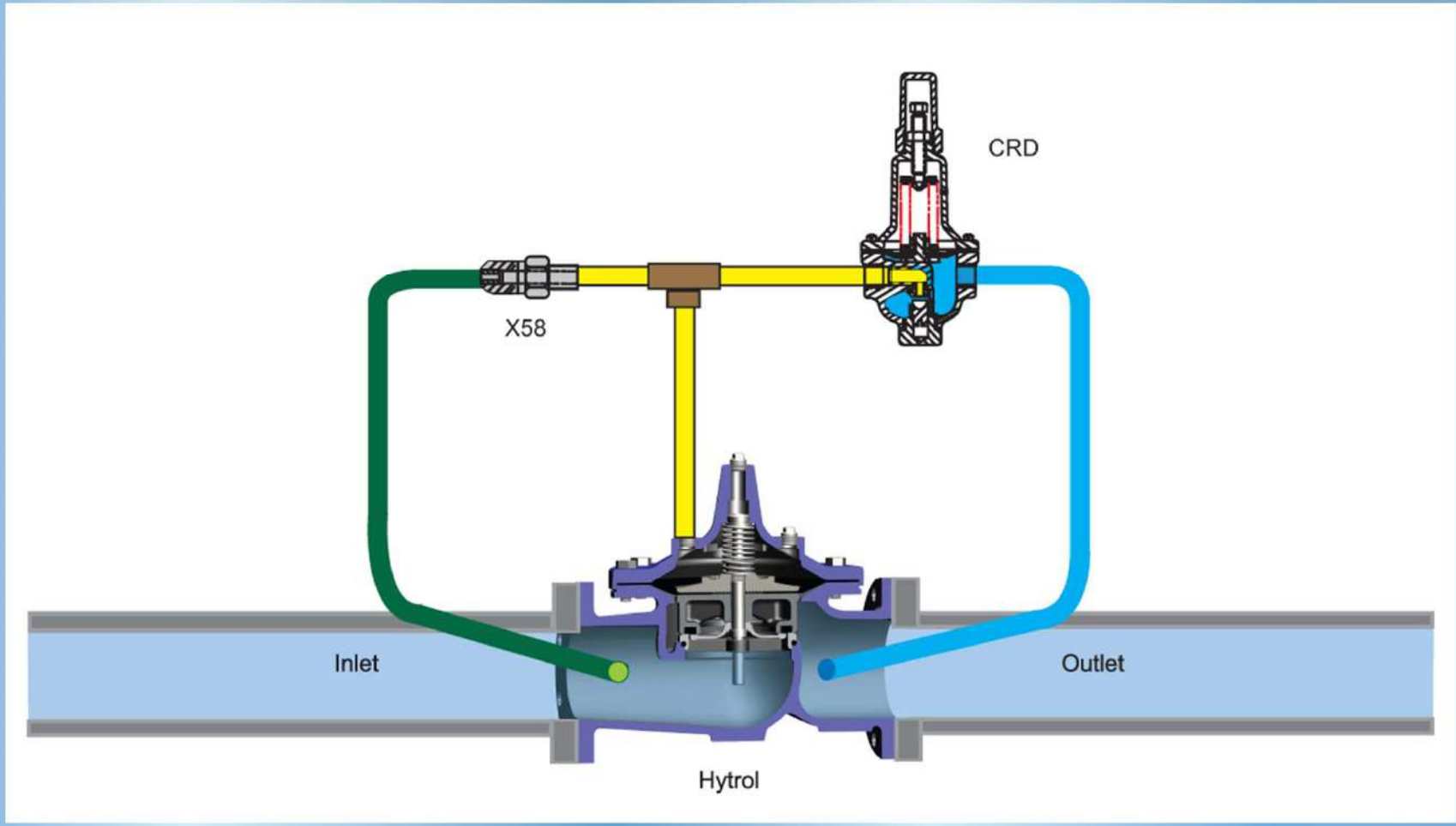
90 Series Pressure Reducing Valve



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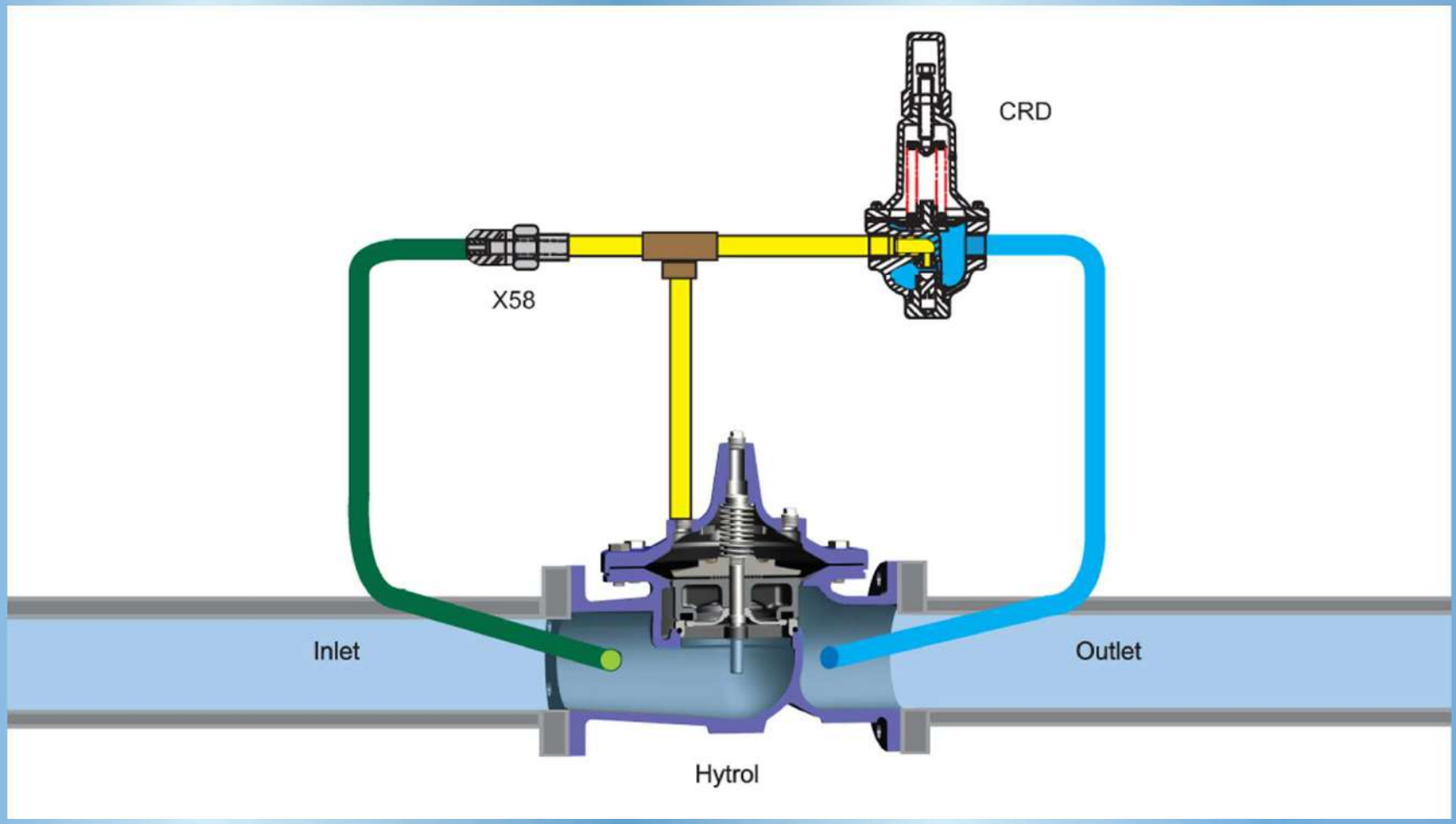
Basic Operation of 90 Series PVS



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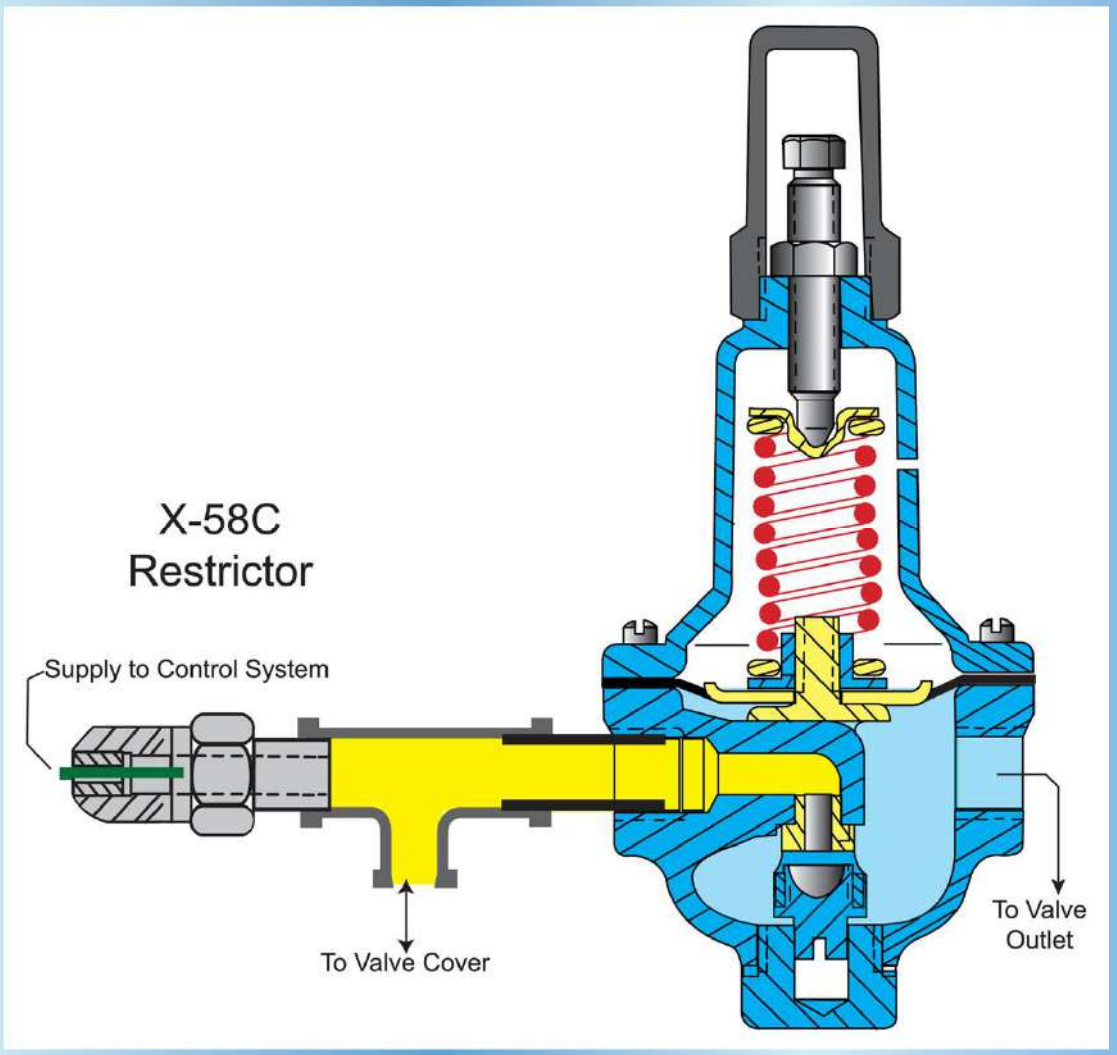
Operation of 90 Series PVS



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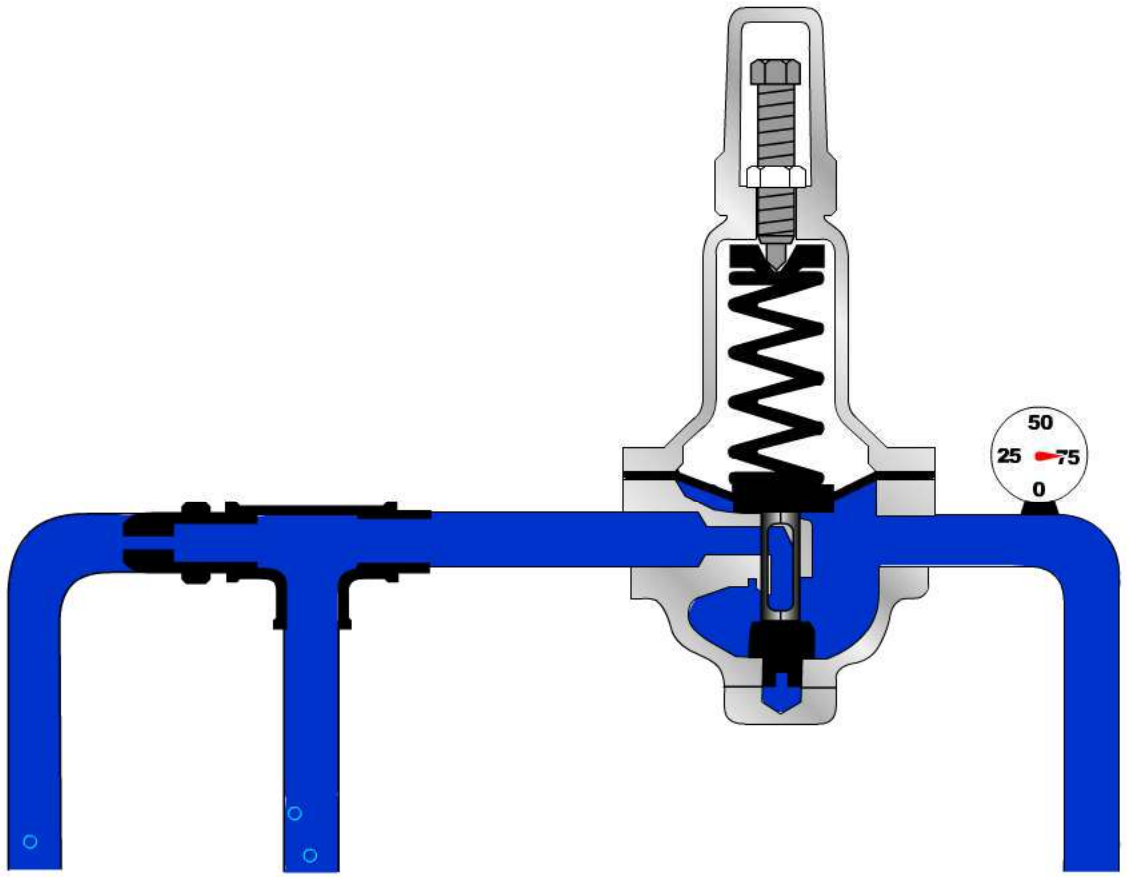
EXIT

CRD

PLAY PAUSE RESTART



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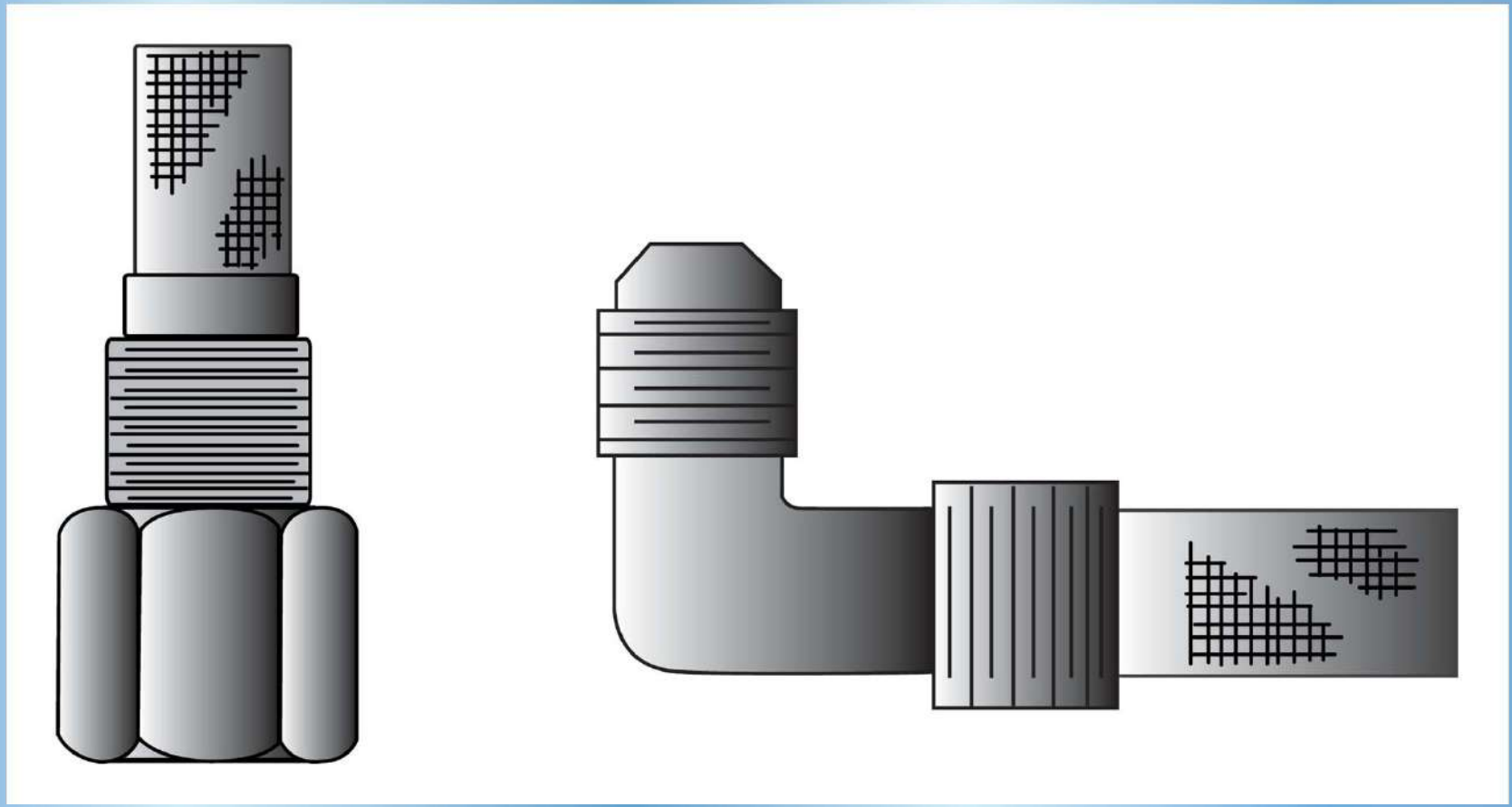
X46 Flow Clean Strainer



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Orifice Restrictions

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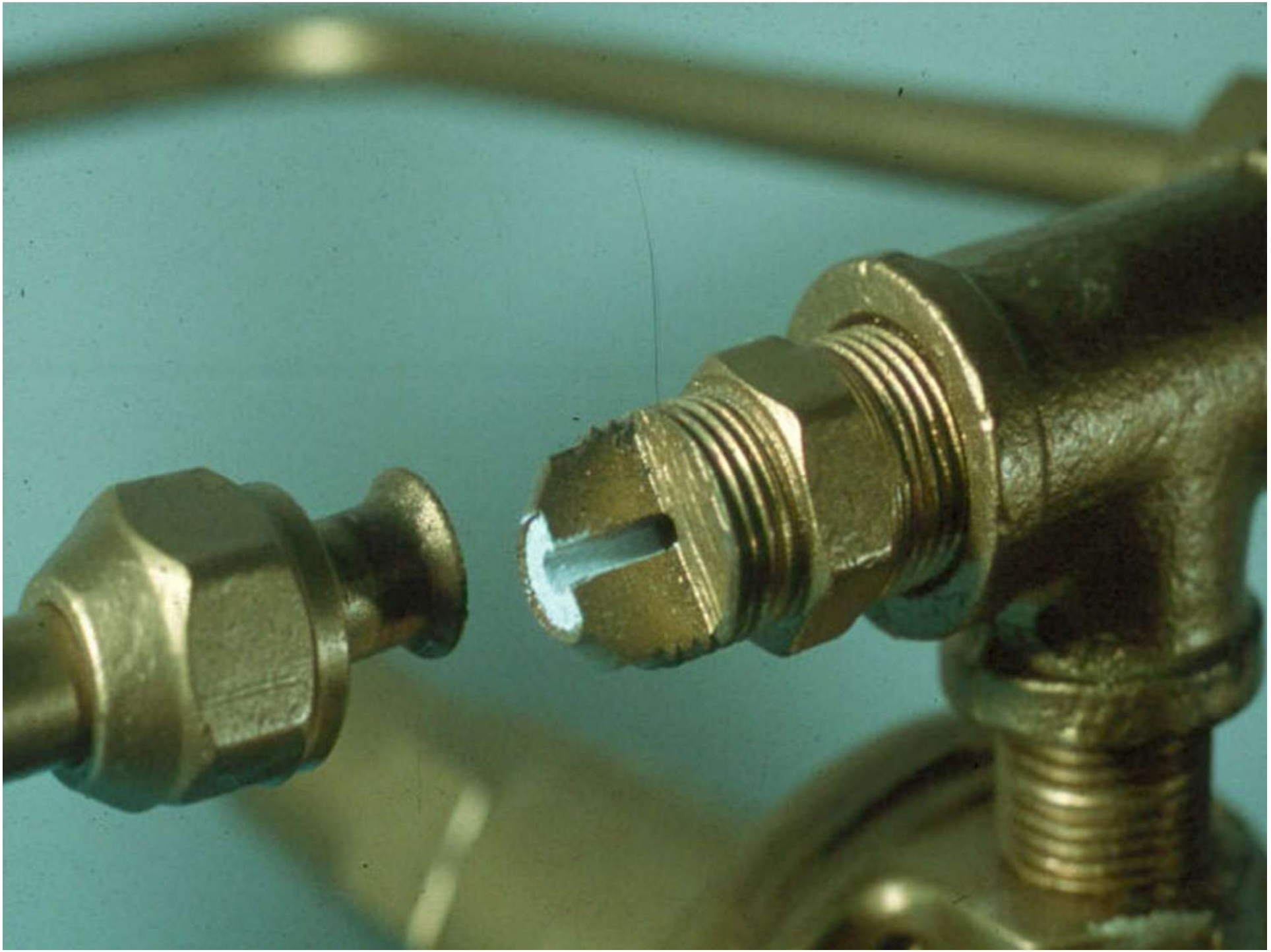

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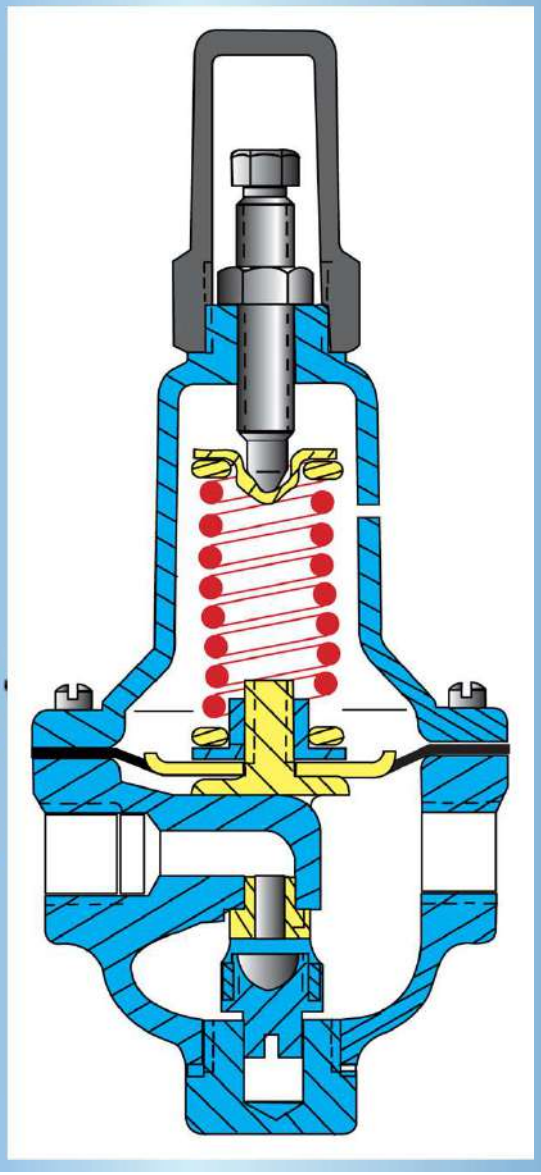
CRD Reducing Pilot Control



- Normally open
- Closes on pressure rise
- Senses outlet pressure

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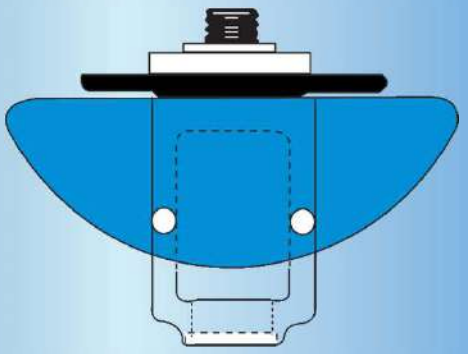
CRD Troubleshooting

- Make a visual check
  - ✓ Cover vent hole
  - ✓ Pressure gauge
- Vary control adjustment
- Check disc
- Check yoke alignment



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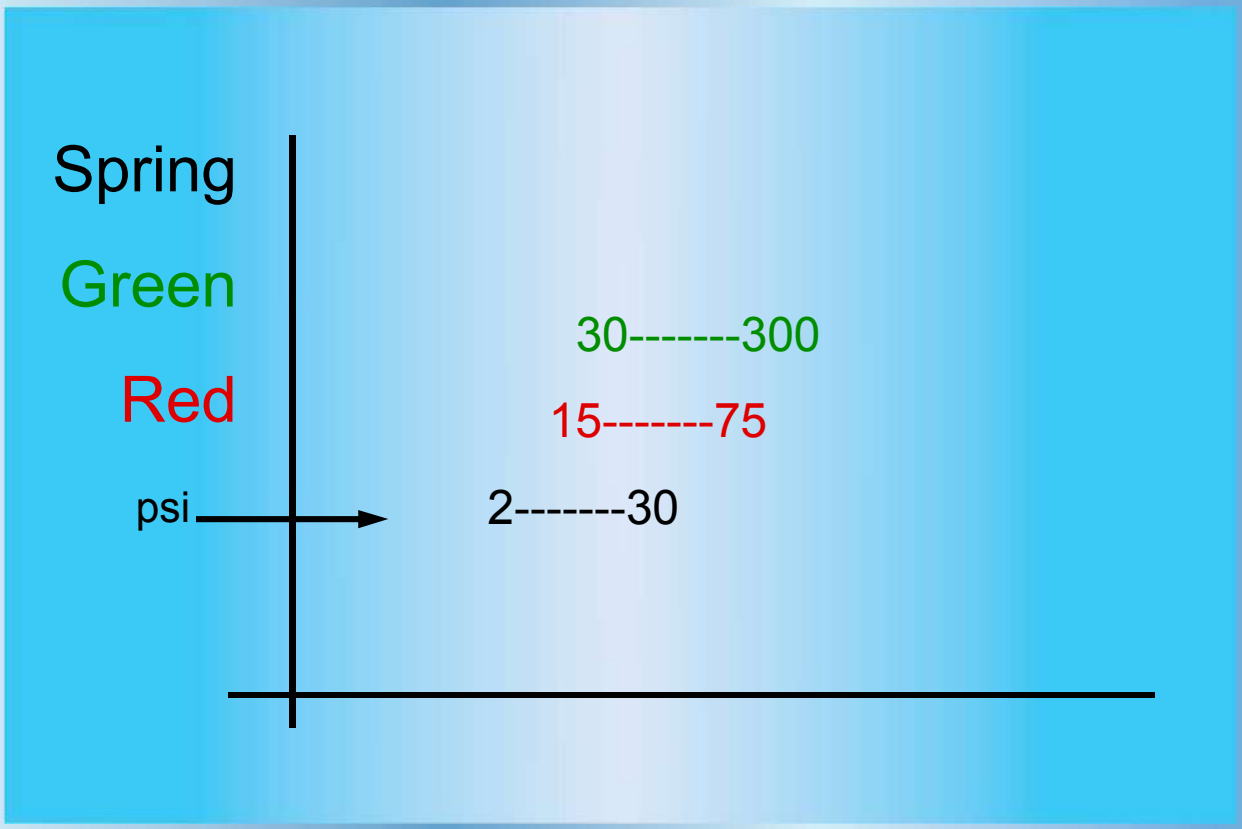
CRD Adjustment Ranges



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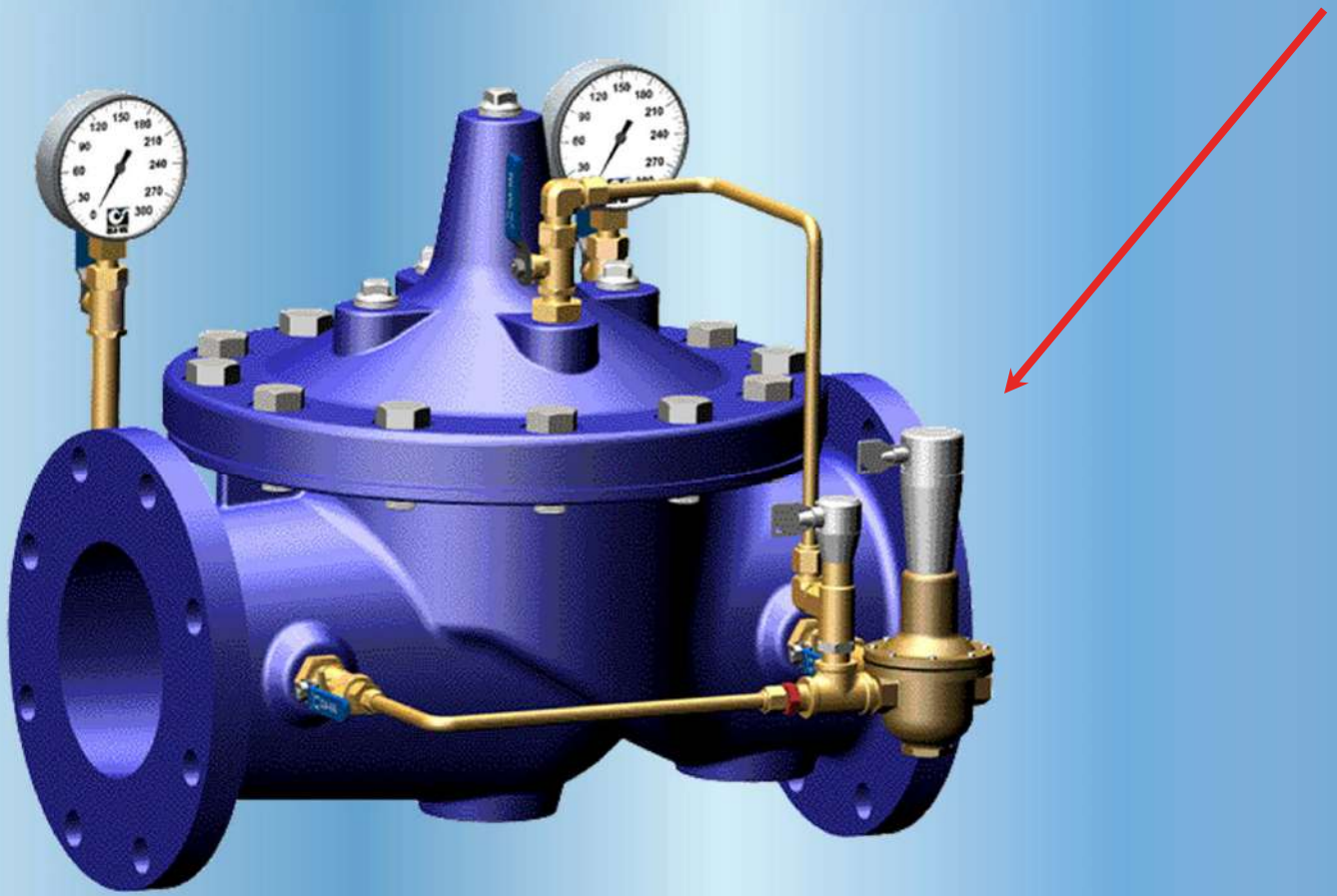
X140 Locking Cap



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X140 Locking Cap

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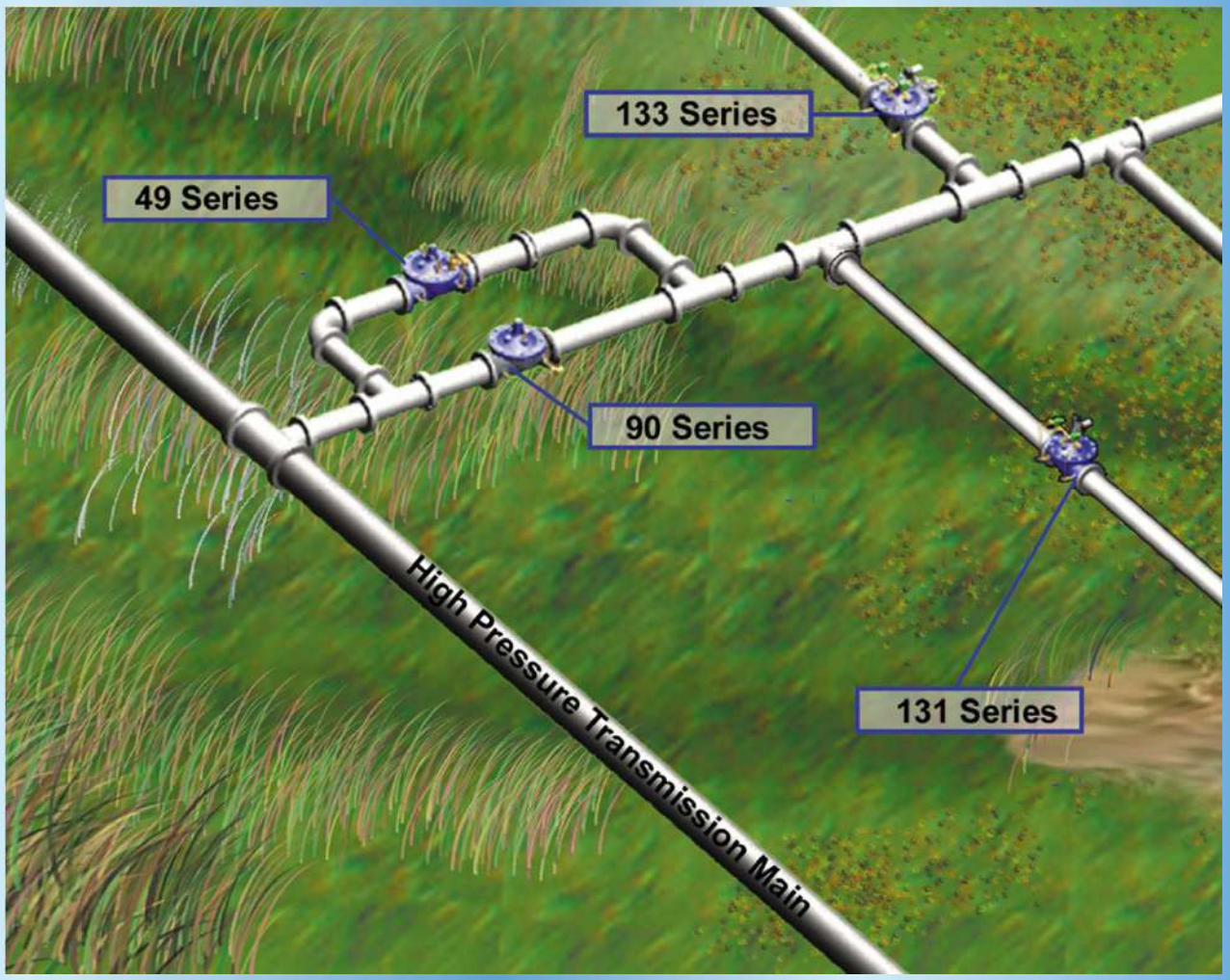
Typical PRV Station - Clayton Valley



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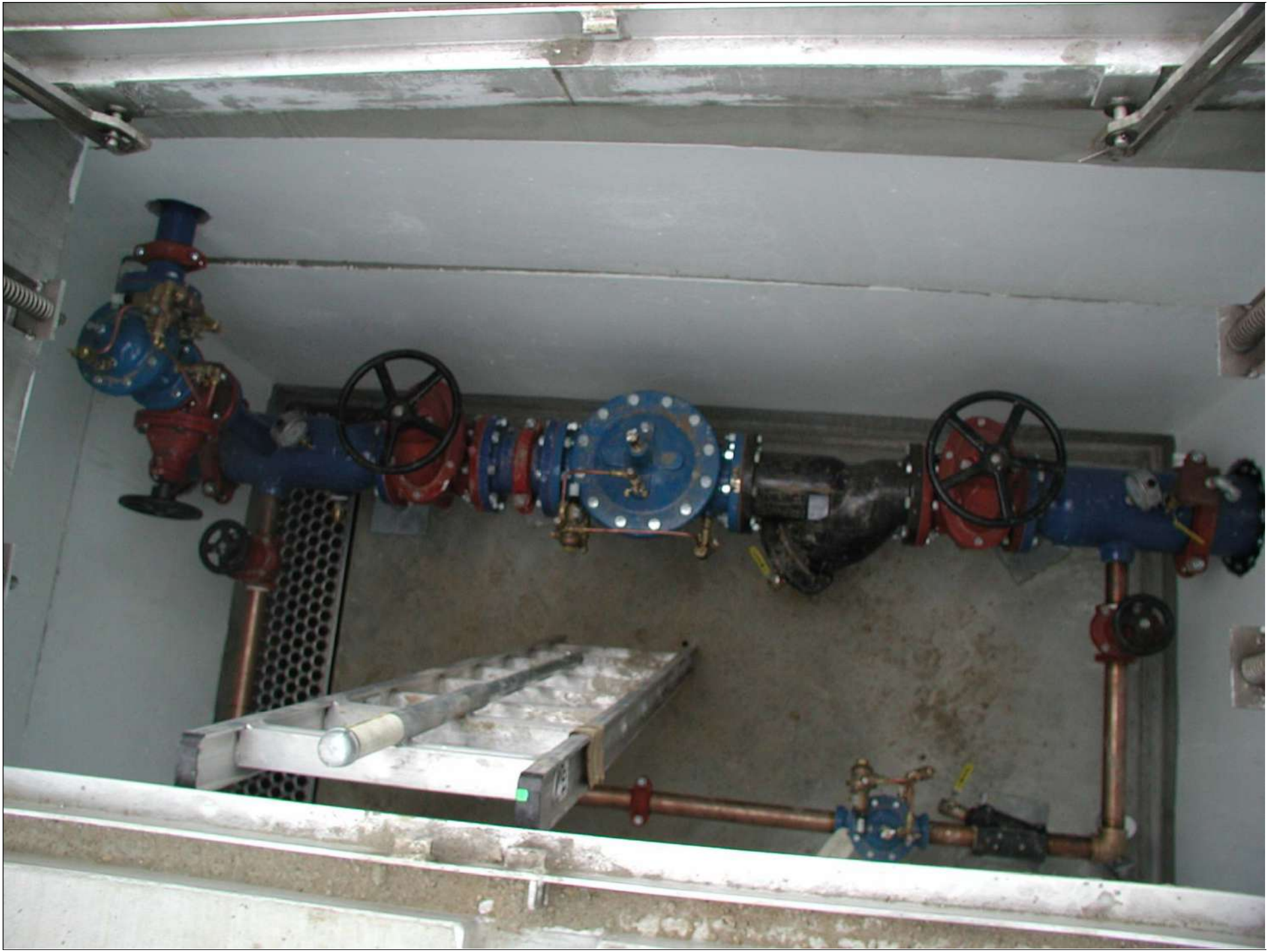

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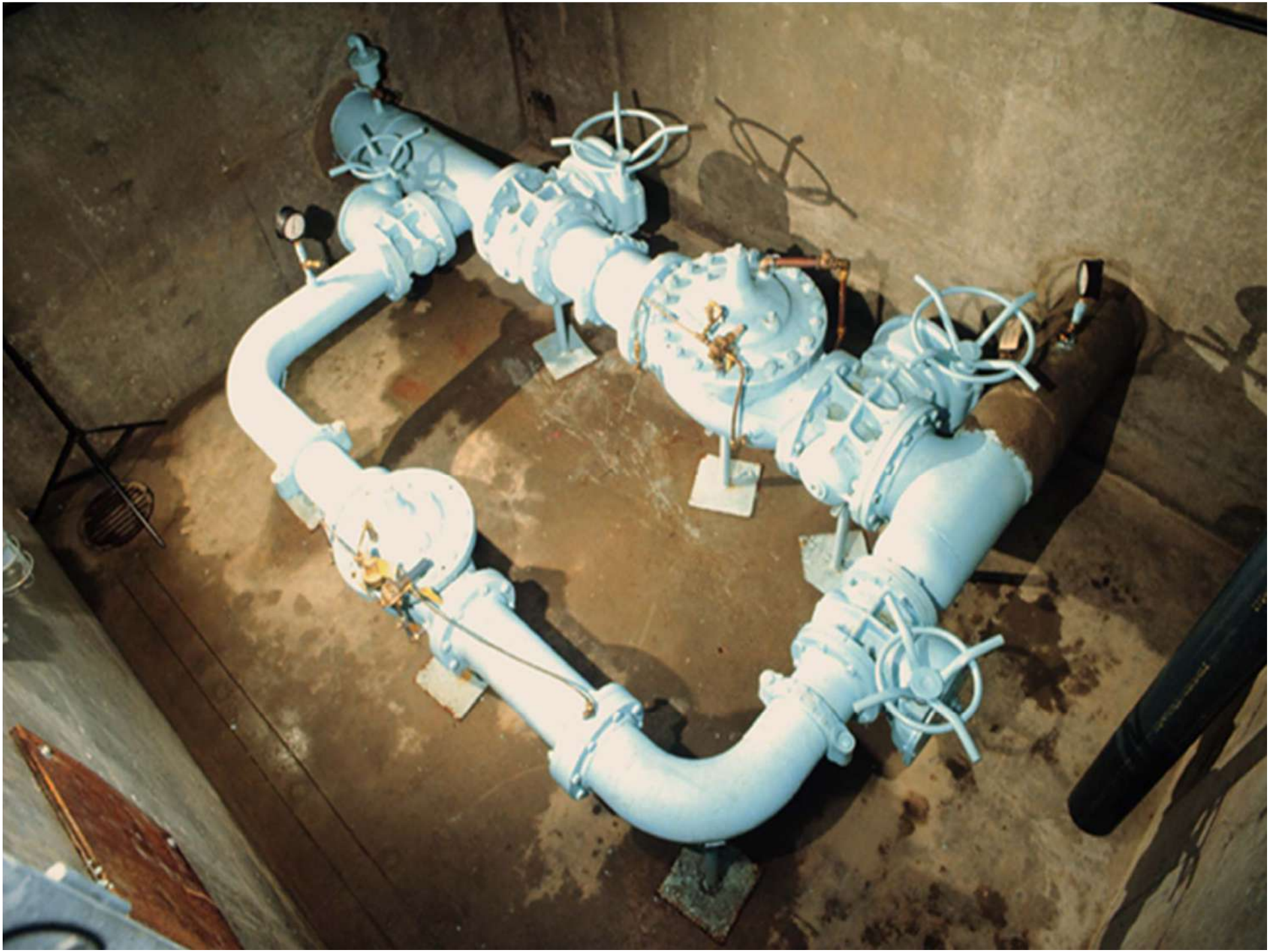

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Sizing Factors and Cavitation

- Flow rate capacity
  - At allowable pressure drop
  - At maximum velocity
- Pressure rating
  - Of valve and pilot system
  - Of valve flange
- Cavitation damage potential
- Materials compatibility

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Valve Selection "Matrix" in Catalog

Valve Selection			These Symbols and Indicate Available Sizes																
		Inches	1¼	1½	2	2½	3	4	6	8	10	12	14	16	18	20	24	30	36
		mm	32	40	50	65	80	100	150	200	250	300	350	400	450	500	600	750	900
		End Detail	Threaded	Threaded & Flanged				Flanged											
Model 90-01	Basic Valve 100-01	Globe	●	●	●	●	●	●	●	●	●	●	●	●			●		●
		Angle		●	●	●	●	●	●	●	●	●	●	●					
	Suggested Flow (gpm)	Max. Continuous	93	125	210	300	460	800	1800	3100	4900	7000	8400	11000			25000		50000
		Max. Intermittent	120	160	260	370	580	990	2250	3900	6150	8720	10540	13700			31300		62500
		Min. Continuous	10	10	15	20	30	50	115	200	300	400	500	650			1750		2900
	Suggested Flow (Liters/Sec)	Max. Continuous	6	8	13	19	29	50	113	195	309	441	529	693			1575		3150
		Max. Intermittent	7.6	10.1	16.4	23	37	62	142	246	387	549	664	863			1972		3940
		Min. Continuous	.6	.6	.9	1.3	1.9	3.2	7.2	13	19	25	32	41			110		180
Model 690-01	Basic Valve 100-20	Globe					●**	●	●	●	●	●	●	●	●	●	●	●	
		Angle						●	●	●									
	Suggested Flow (gpm)	Max. Continuous					260	580	1025	2300	4100	6400	9230	9230	16500	16500	16500	28000	
		Min. Continuous					15	30	50	115	200	300	500	500	900	900	900	1850	
	Suggested Flow (Liters/Sec)	Max. Continuous					16	37	65	145	258	403	581	581	1040	1040	1040	1764	
		Min. Continuous					.9	1.9	3.2	7.2	13	19	32	32	57	57	57	117	

690-01 is the reduced internal port size version of the 90-01.

**Flanged End Detail Only

For 100-01 basic valves, suggested flow calculations were based on flow through Schedule 40 Pipe. Maximum continuous flow is approx. 20 ft/sec (6.1 meters/sec) & maximum intermittent is approx. 25 ft/sec (7.6 meters/sec) and minimum continuous flow is approx. 1 ft/sec (.3 meters/sec). For 100-20 basic valves, suggested flow calculations were based on flow through the valve seat. Approx. 26 ft/sec (7.9 meters/sec) was used for maximum continuous flow & 1 ft/sec (.3 meters/sec) is used for minimum continuous flow. Maximum continuous flow through the valve seat for the 30" 100-20 is approx. 20 ft/sec (6.1 meters/sec).

Many factors should be considered in sizing pressure reducing valves including inlet pressure, outlet pressure and flow rates. For sizing questions or cavitation analysis, consult Cla-Val with system details.

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Cavitation Damage

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Cavitation Damage

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Cavitation Damage

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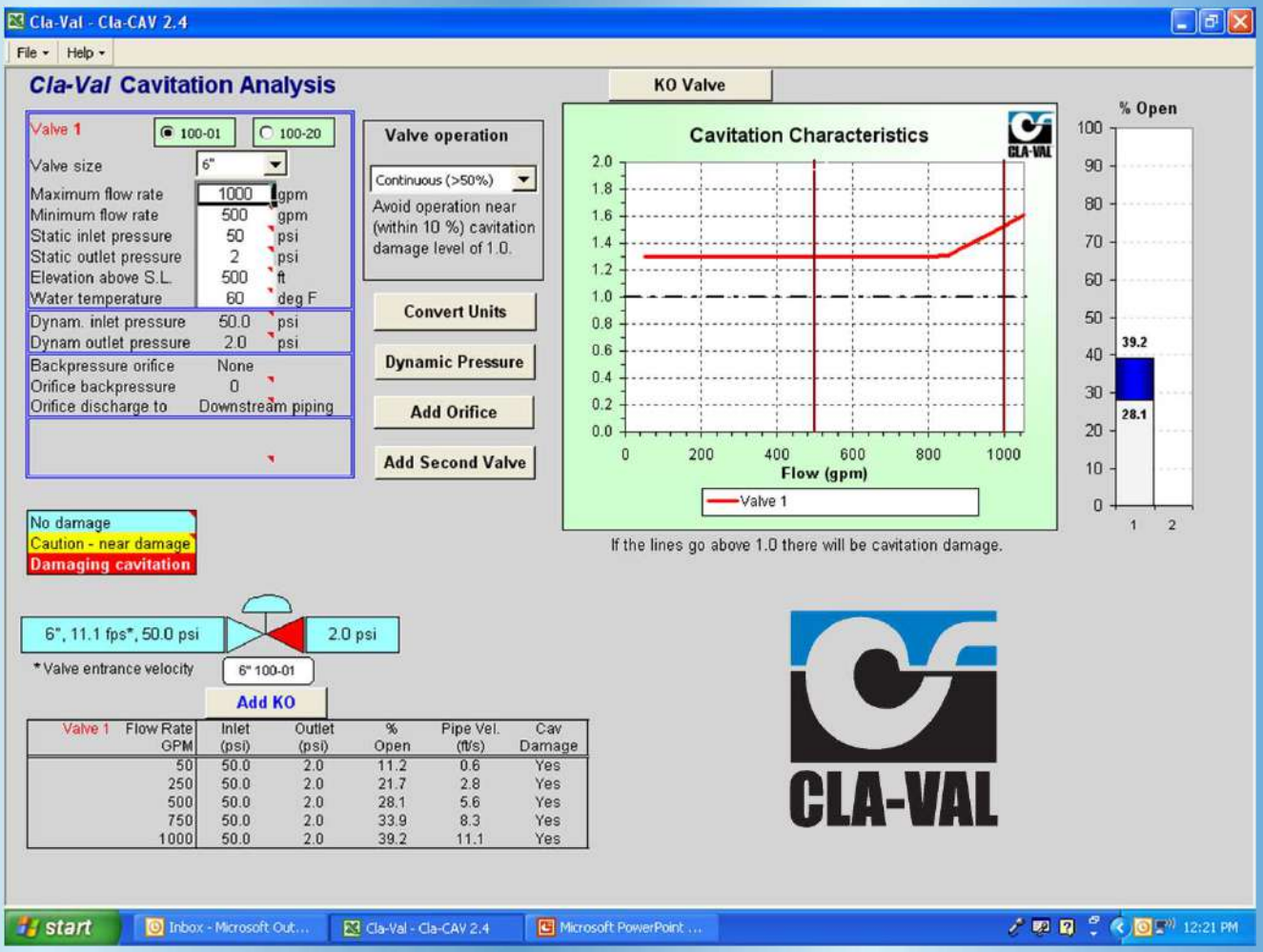
CLA-CAV Cavitation Analysis Program



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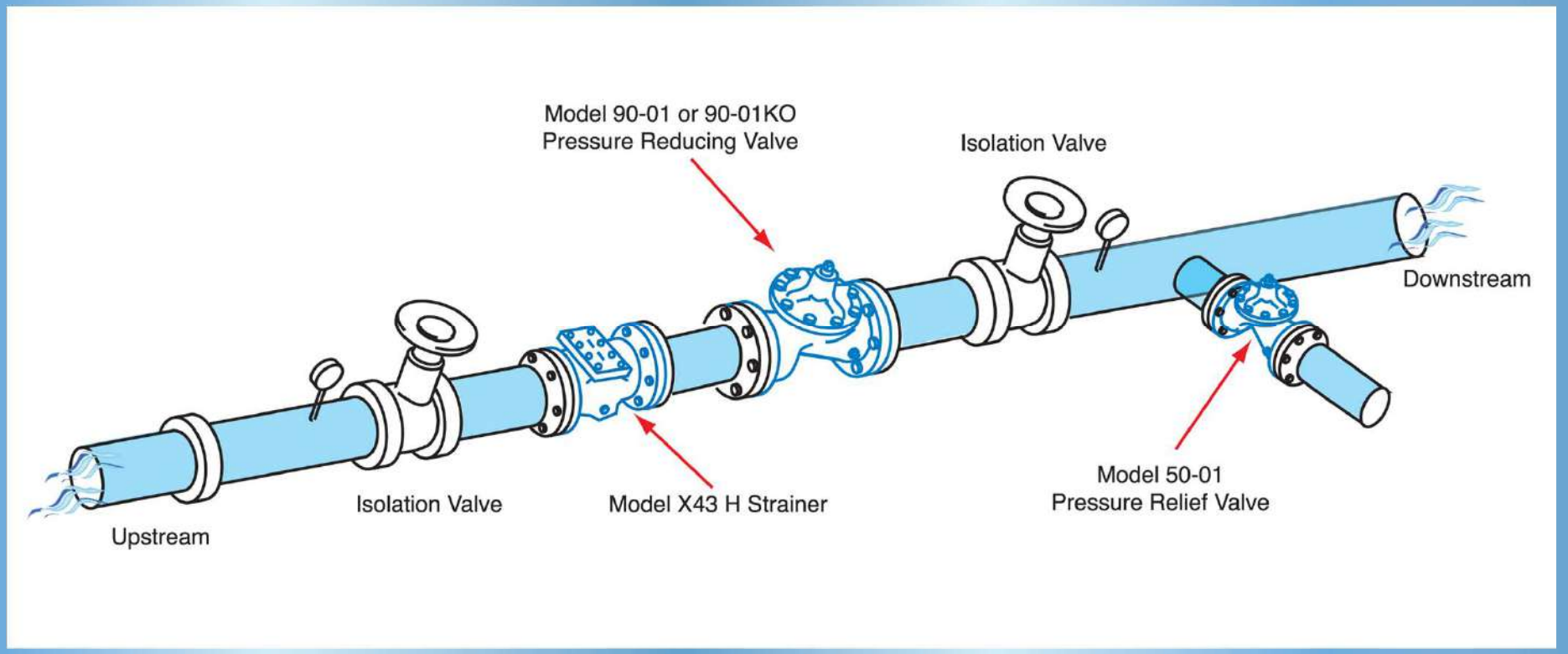
Pressure Reducing Application: High Pressure Drop



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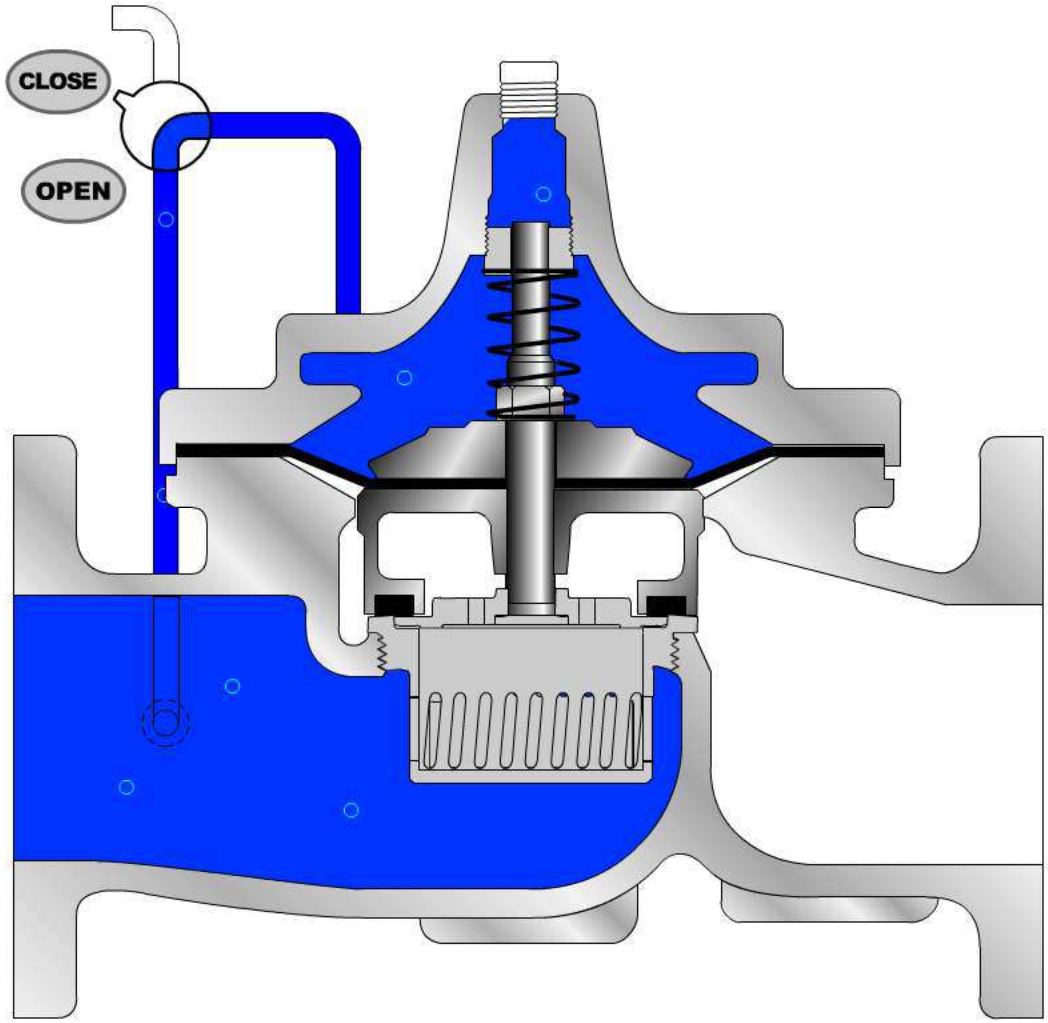
EXIT

100-01K0 Anti-Cavitation Hytrol Valve

PLAY PAUSE RESTART



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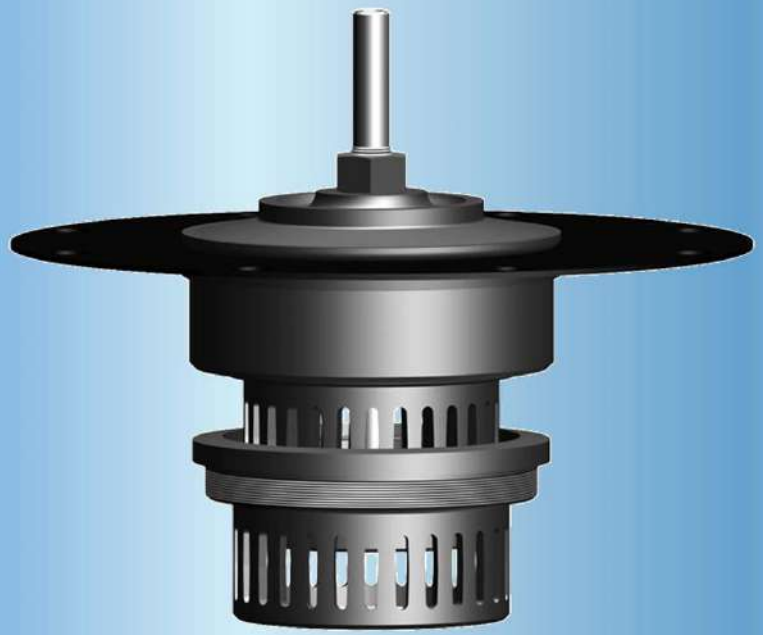
100-01KO Anti-Cavitation Components



Disc Guide Seat

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KO Anti-Cavitation Retrofit Kit

CLA-VAL

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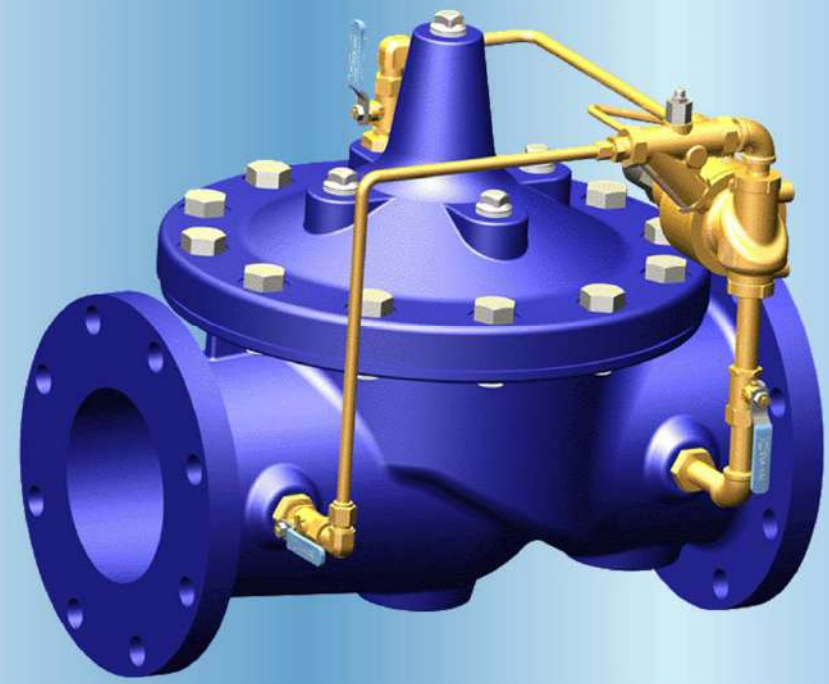
Pressure Relief Valves



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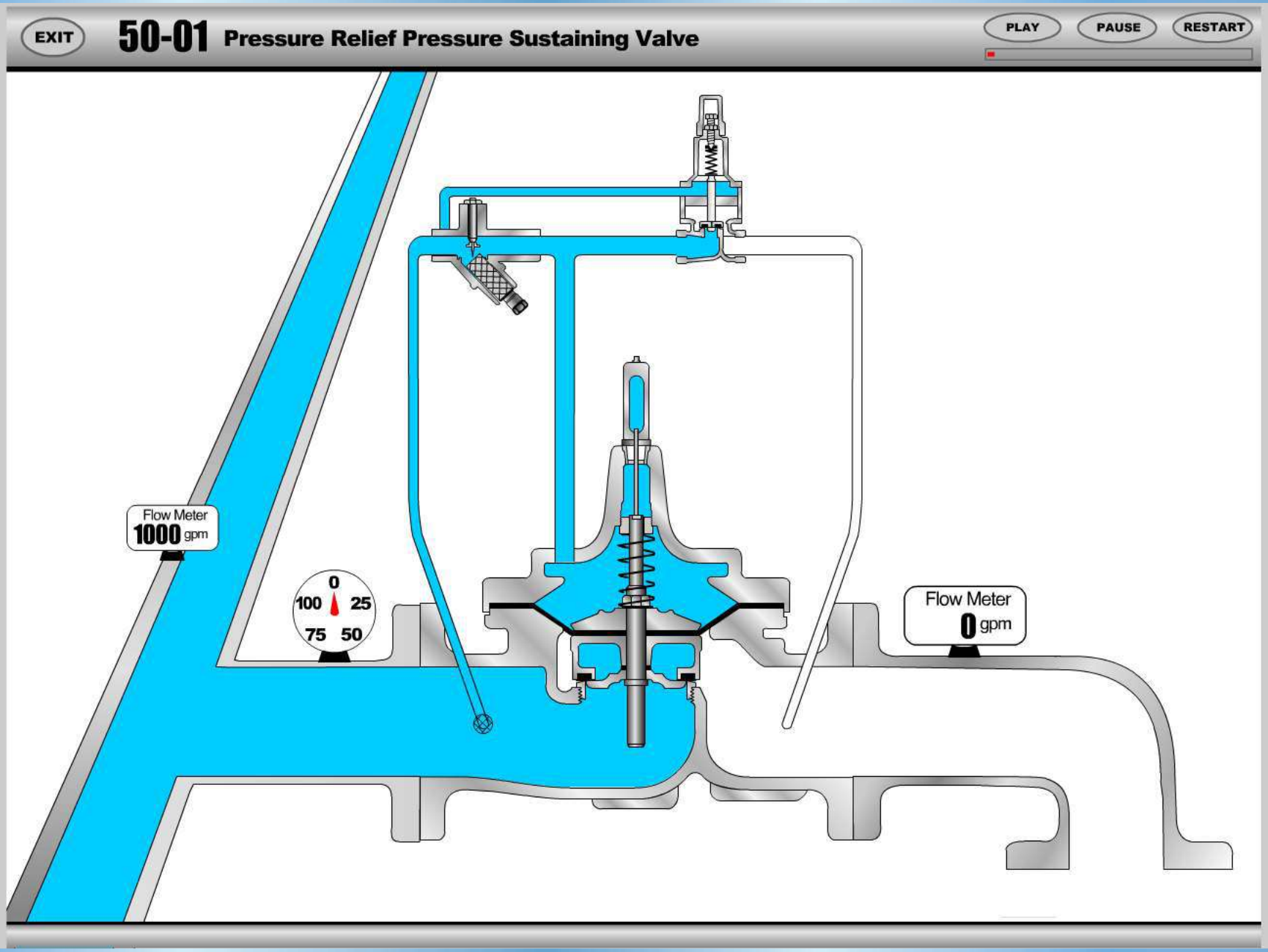

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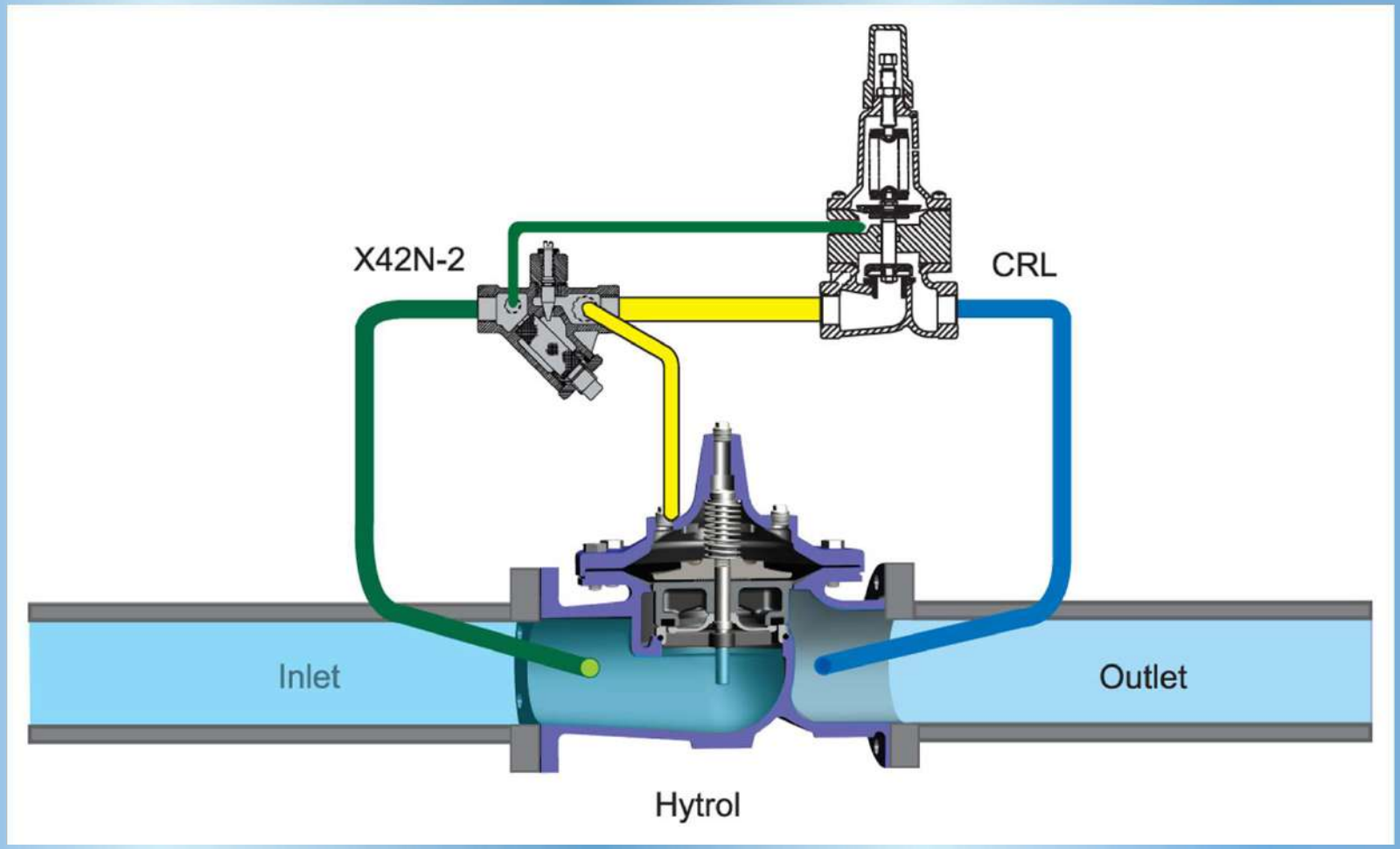
50 Series Principles of Operation



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One Valve…Three Functions

- Pressure Relief
- Pressure Sustaining
- Back Pressure

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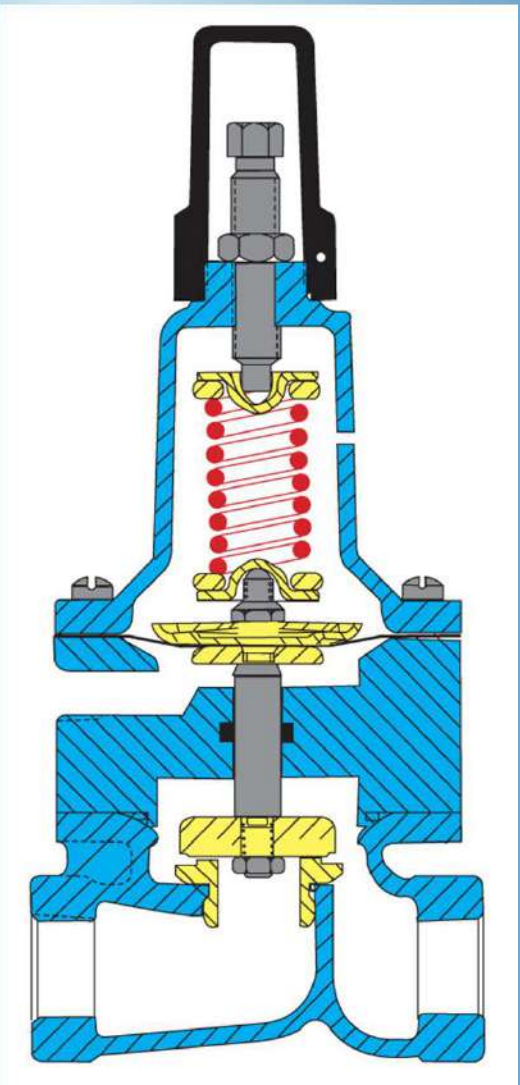
CRL Relief Pilot Control



- Normally closed
- Opens on pressure rise
- Senses inlet pressure remotely

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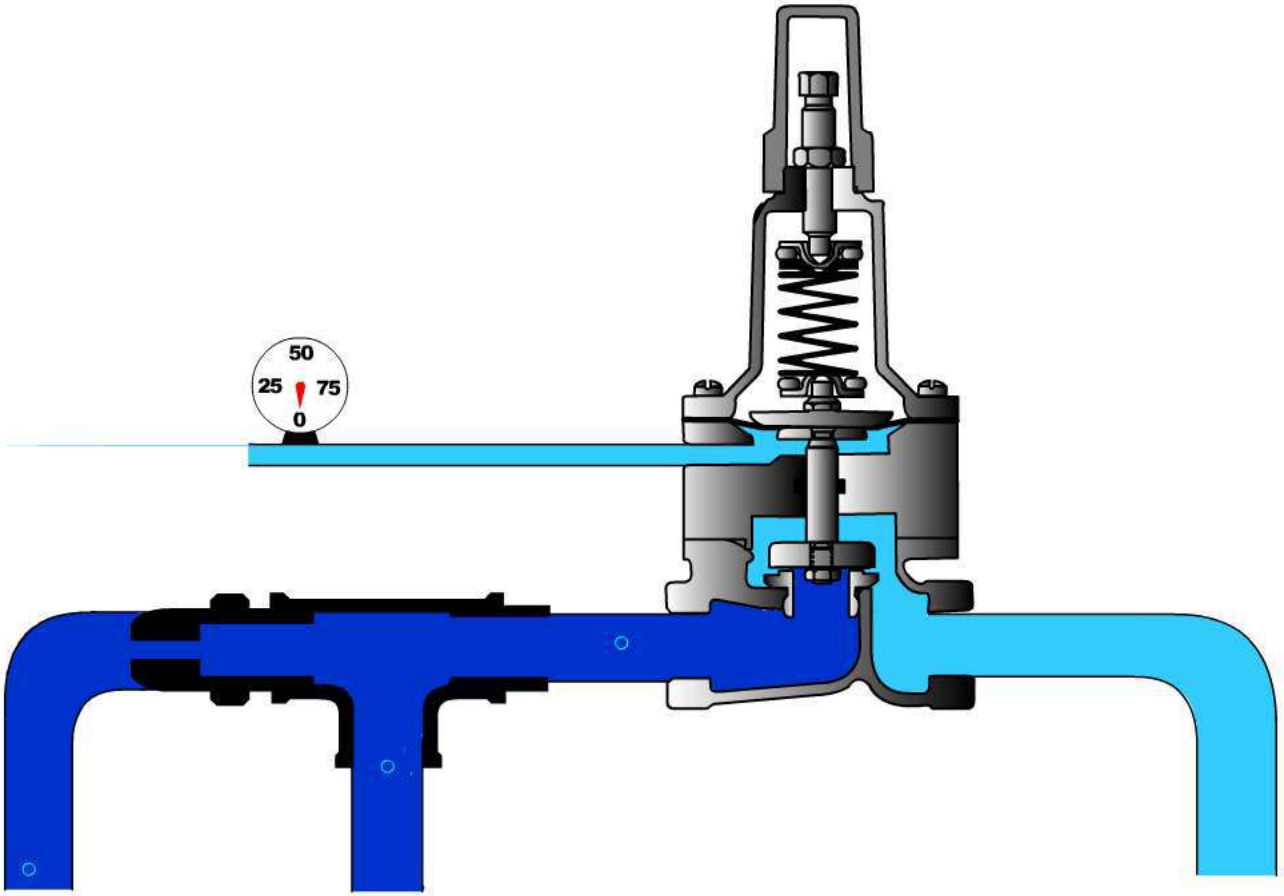
EXIT CRL

PLAY PAUSE RESTART



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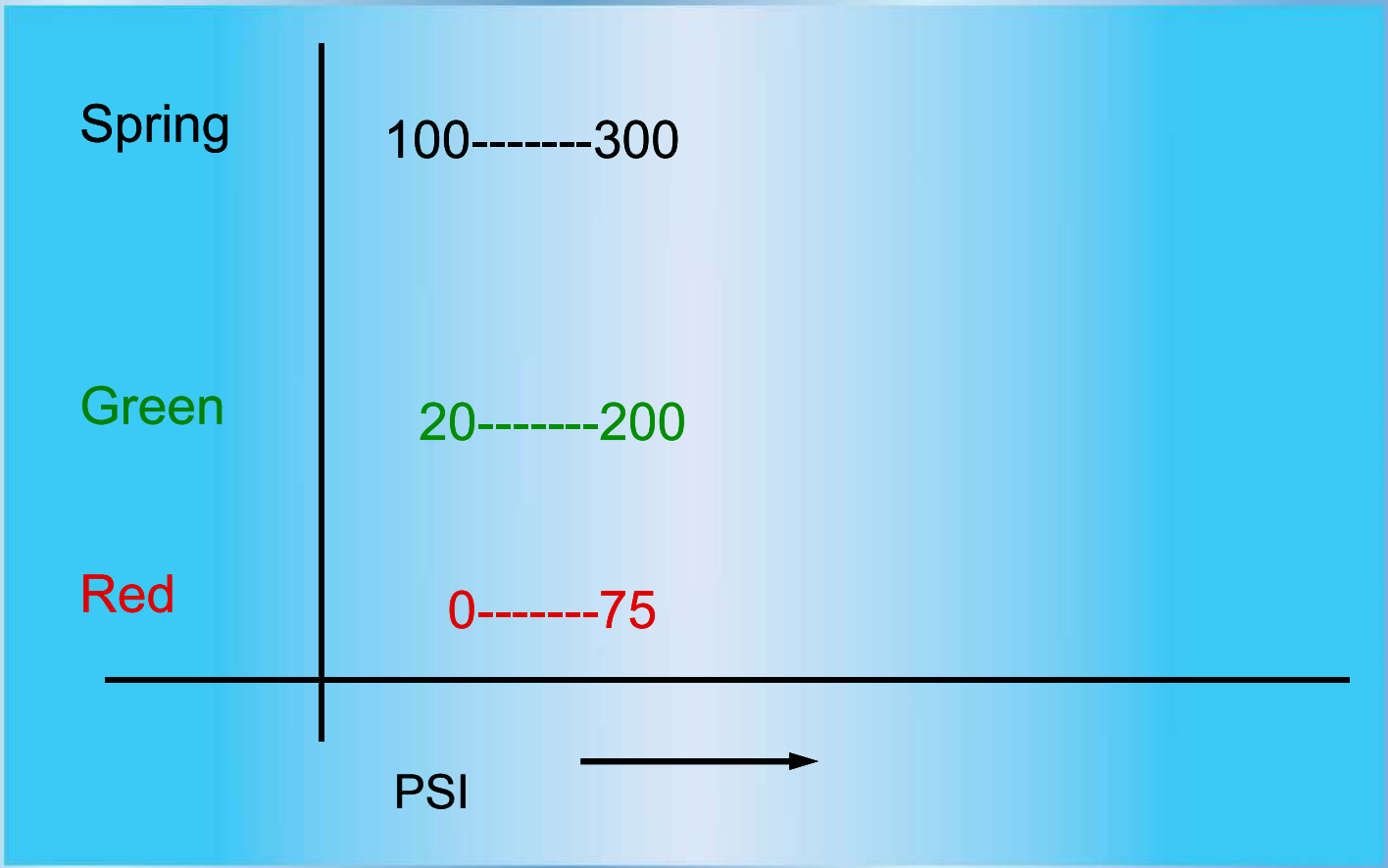
CRL Adjustment Ranges



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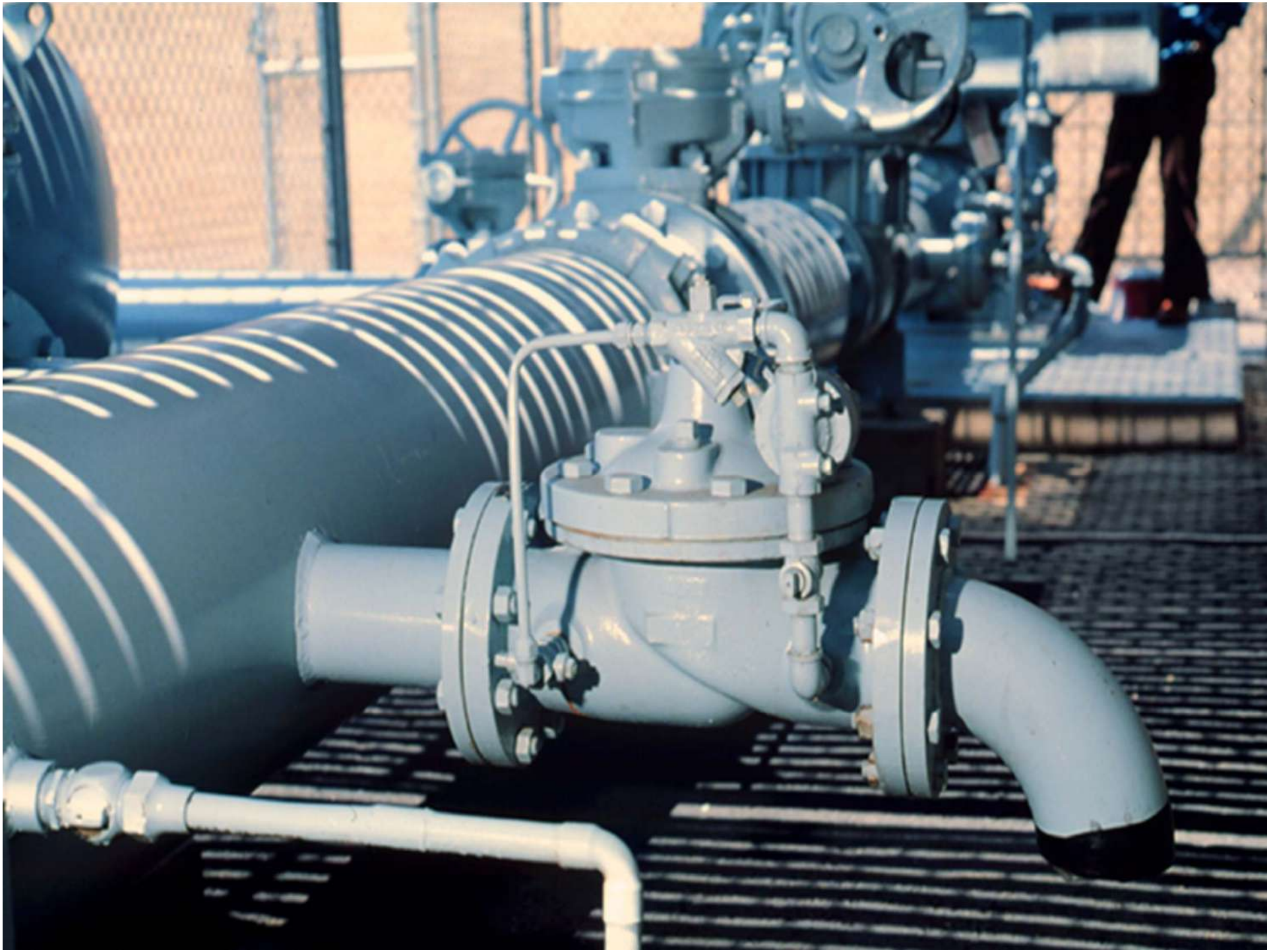

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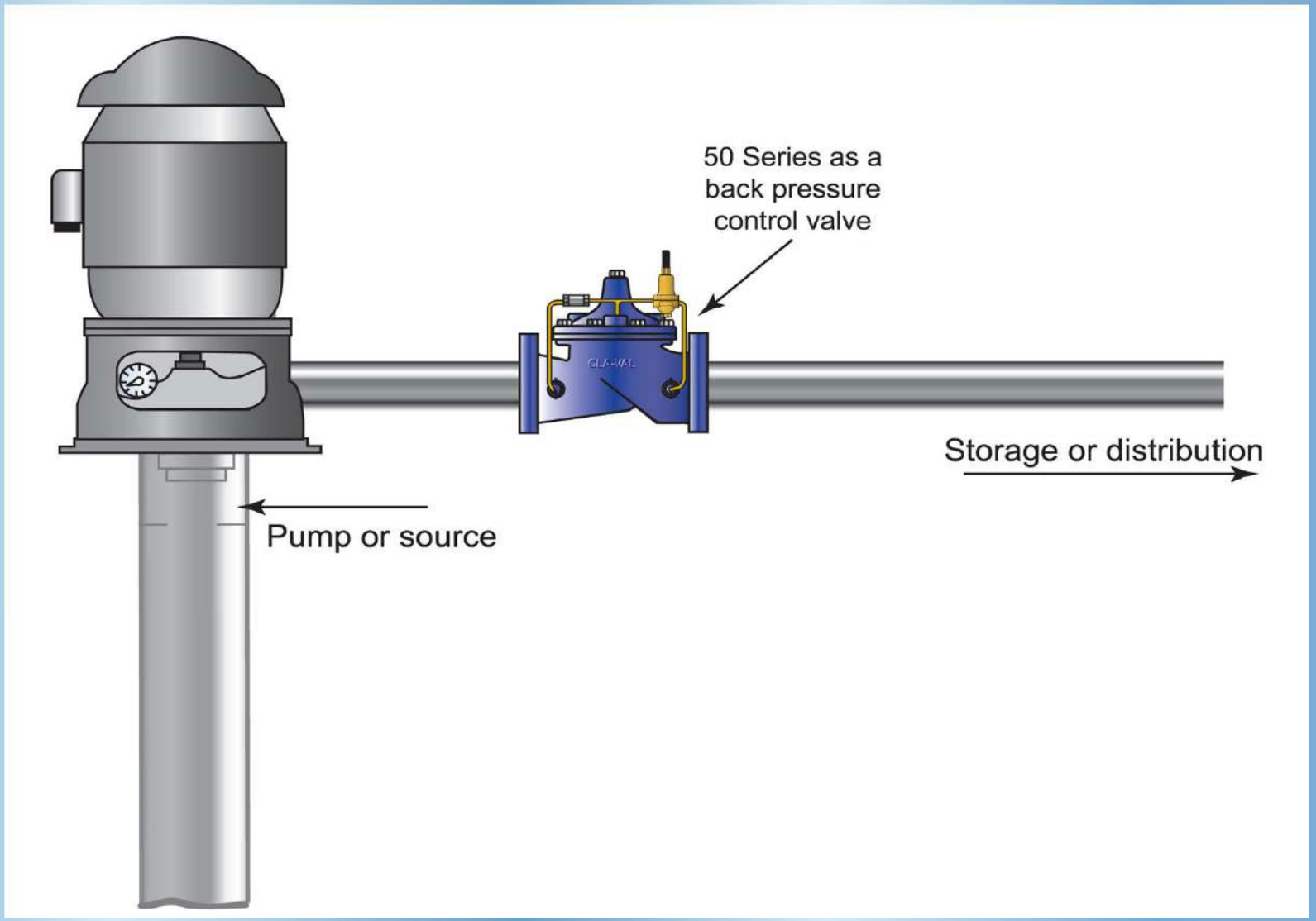
Typical Back Pressure Application



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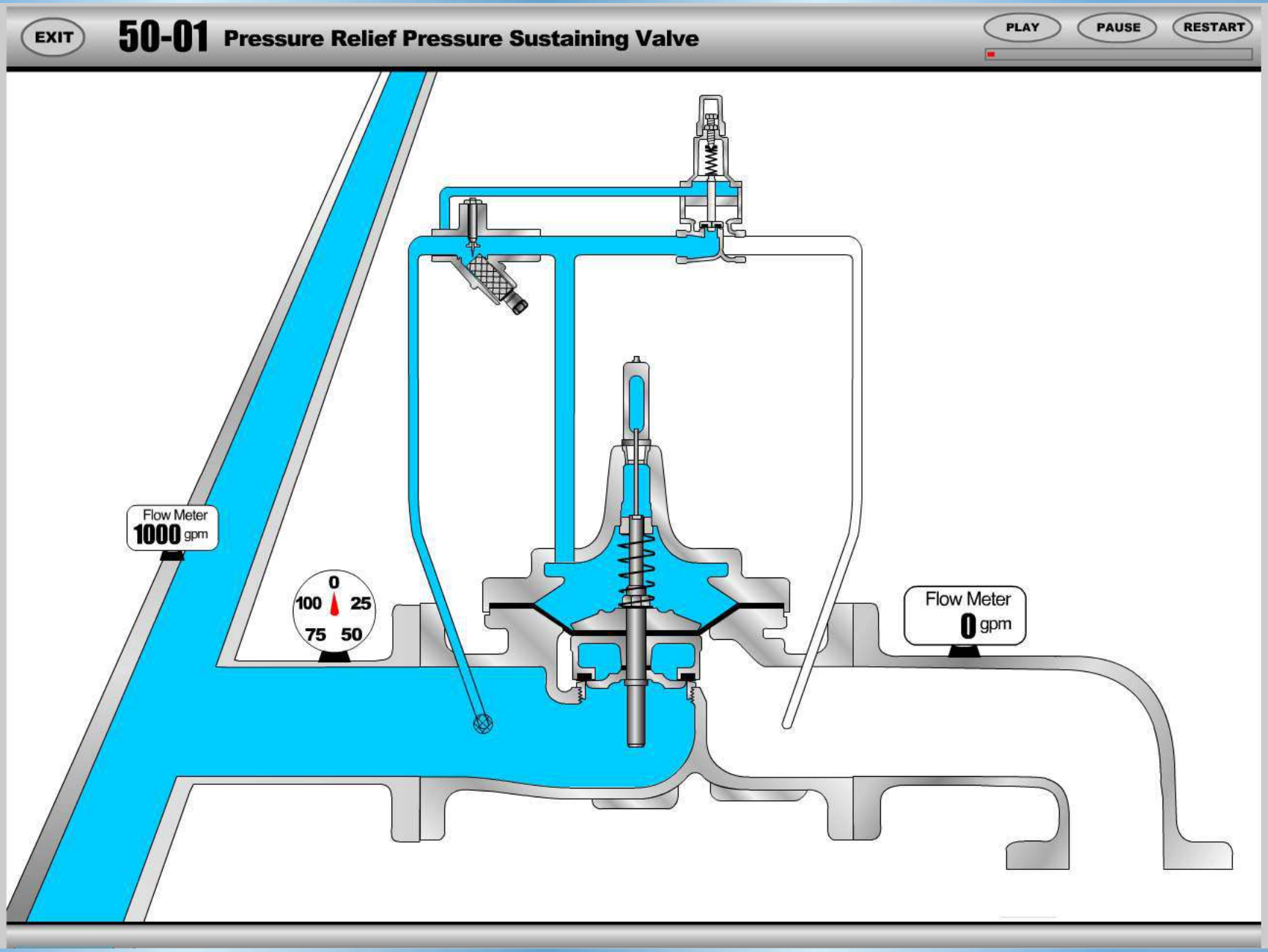

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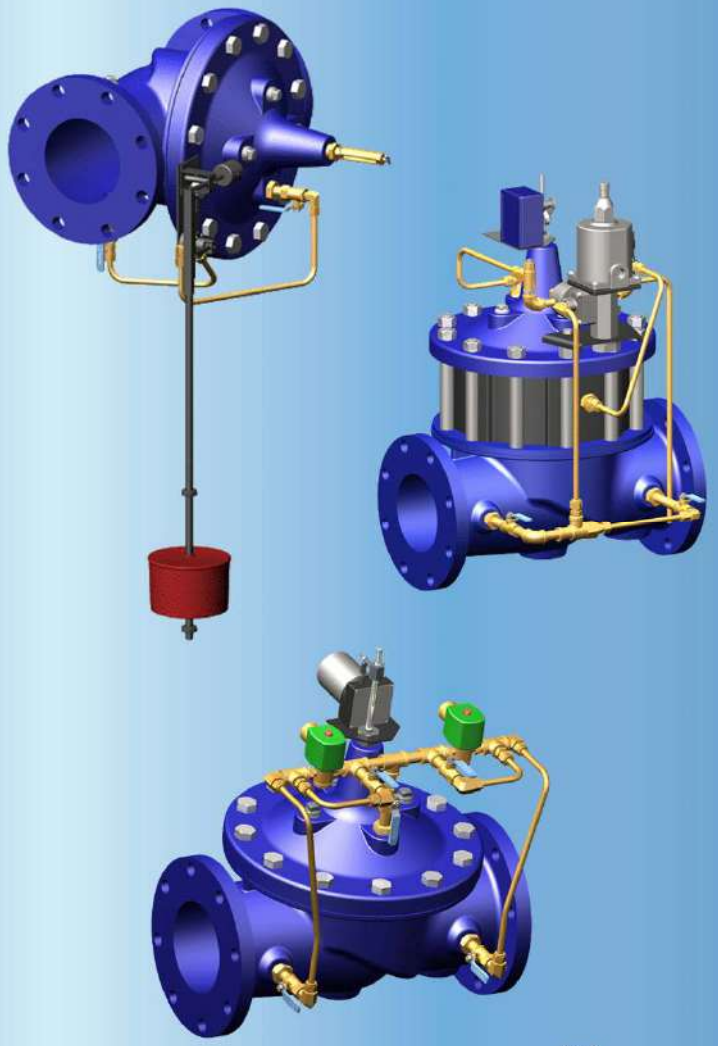
Non-Modulating Valves

- Level Control Valves
  - Float or Floatless
- Remote Control Valves
  - Manual or Electronic
- Pump Control Valves
  - Well or Booster Stations



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Two Basic Types of Level Control

Float

Floatless

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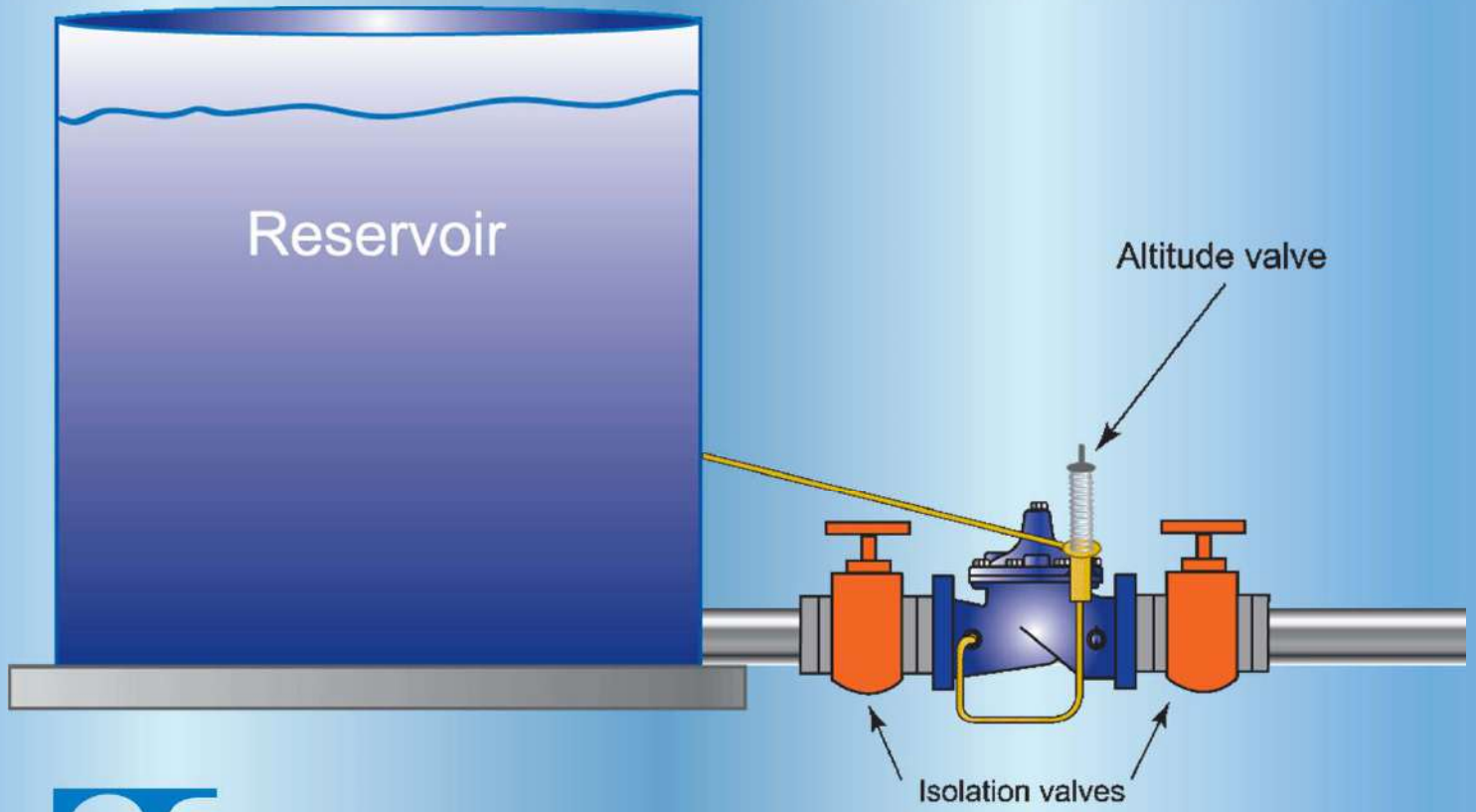
Floatless or Altitude Valve - 210 Series



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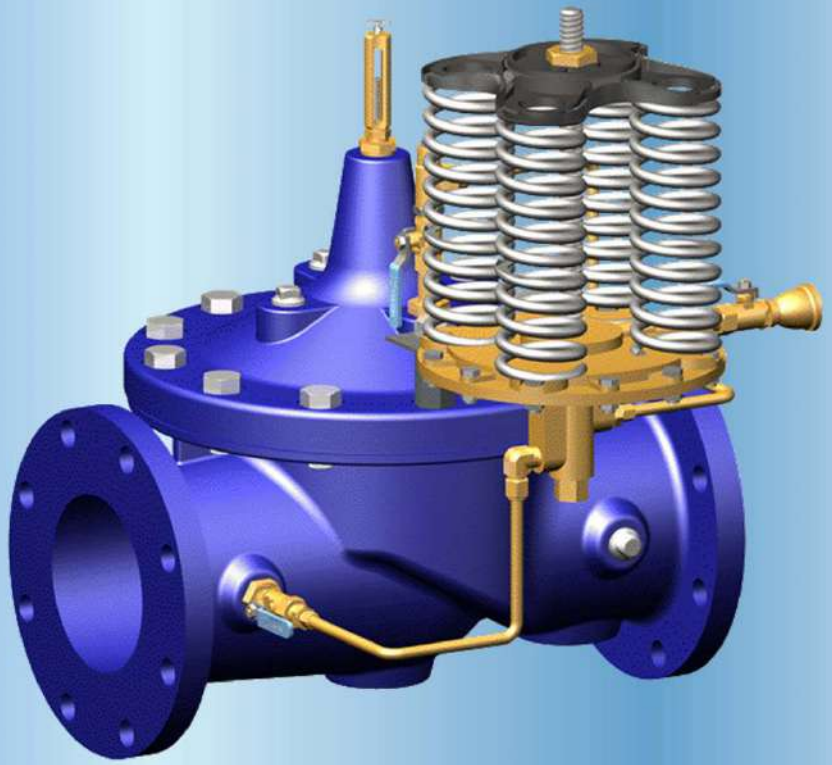
CDS6A Liquid Level Control



- Three-way pilot design
- Spring adjustable level setting
- Reservoir level sensed as pressure head changes

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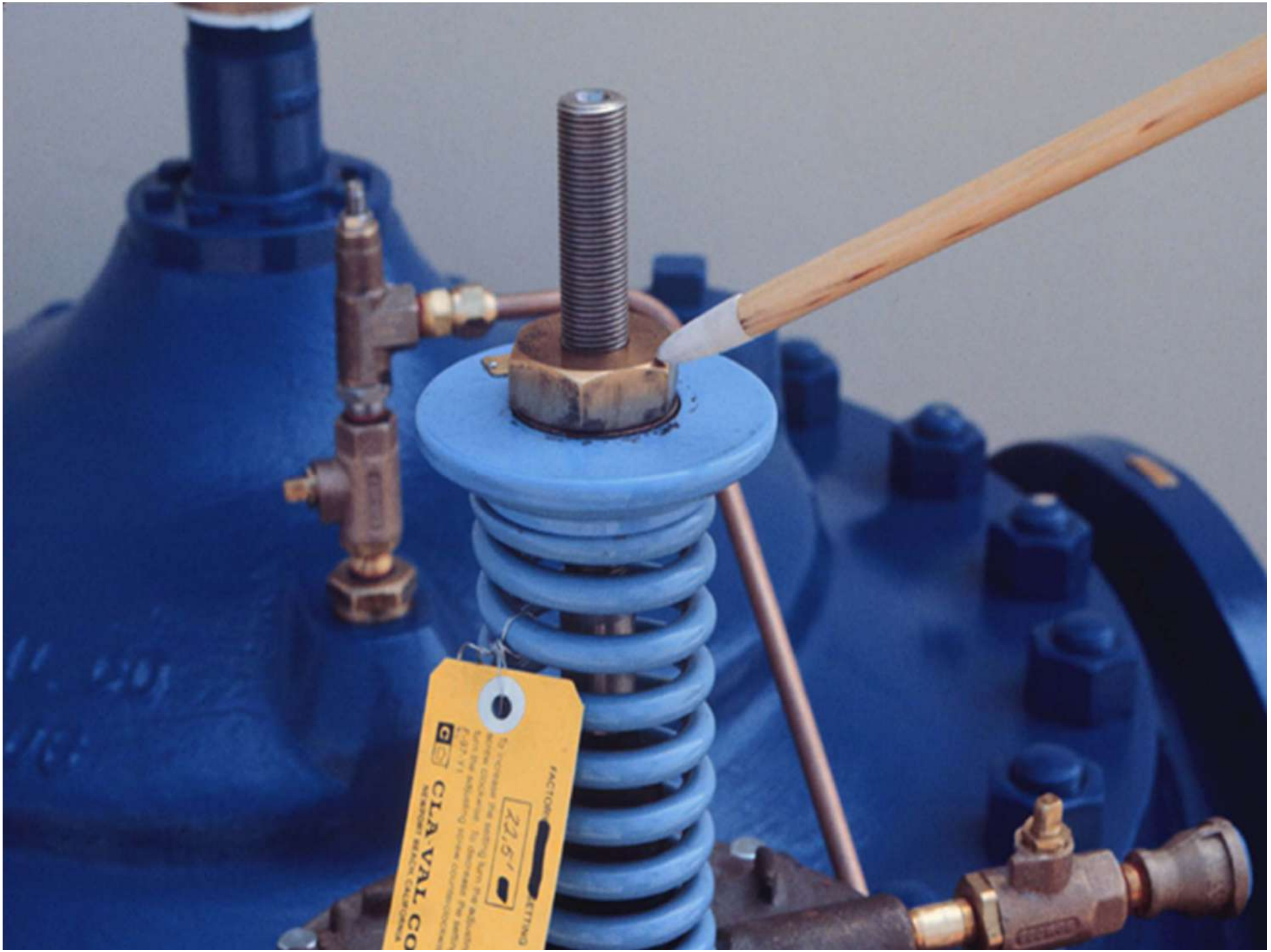

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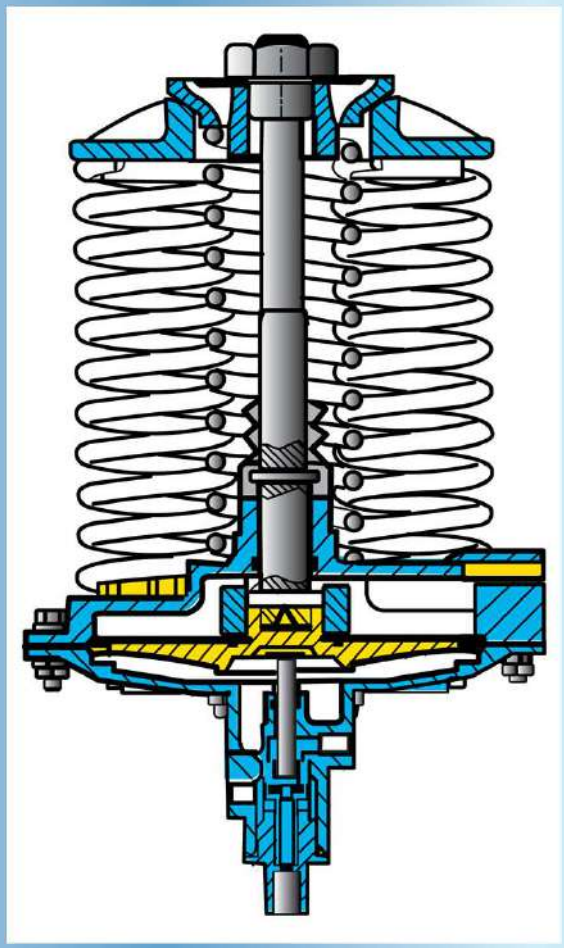
CDS-6 has 5 adjustment ranges with 1 spring



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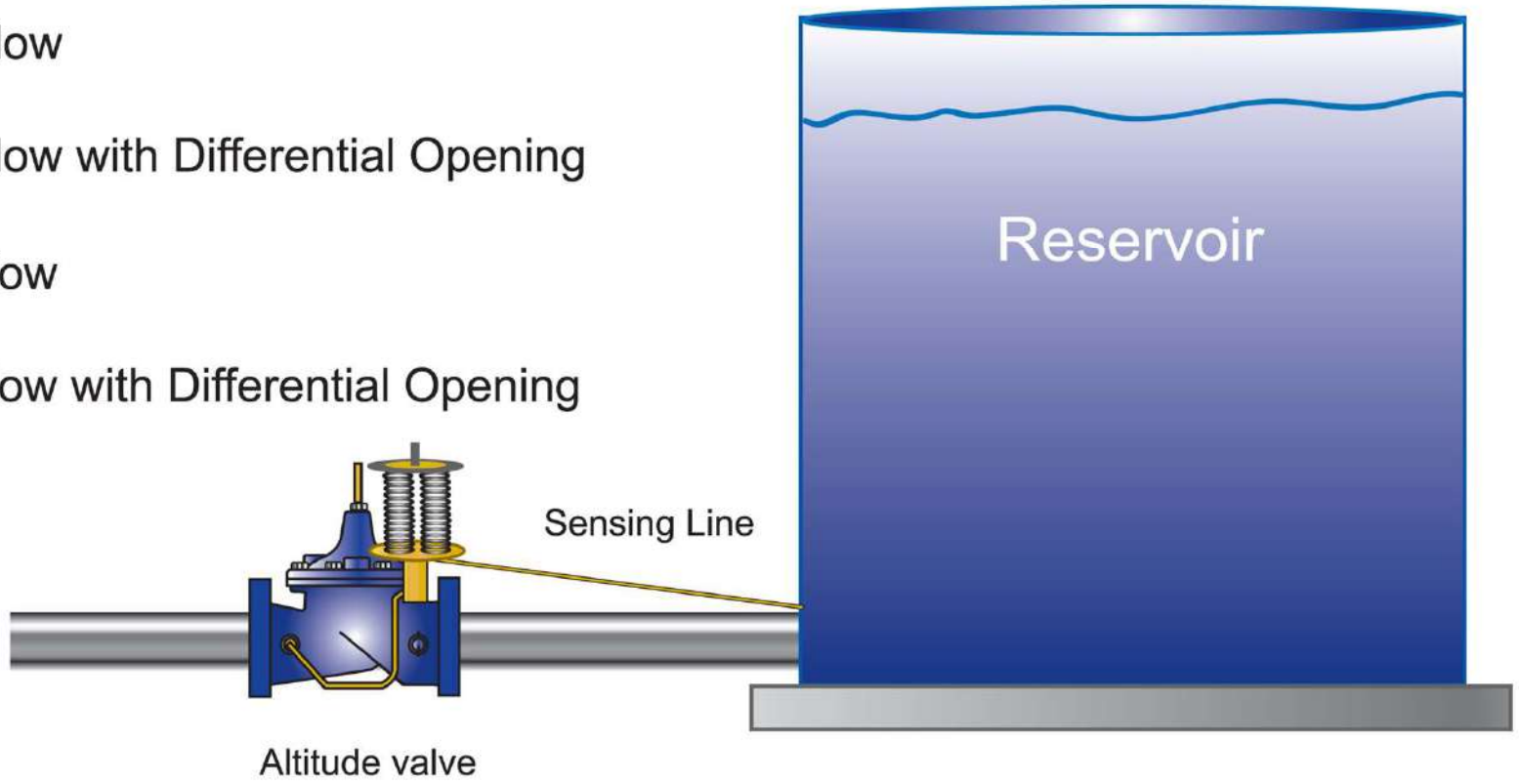
Cla-Val Altitude Valves: Four Basic Types

- One-Way Flow
- One-Way Flow with Differential Opening
- Two-Way Flow
- Two-Way Flow with Differential Opening



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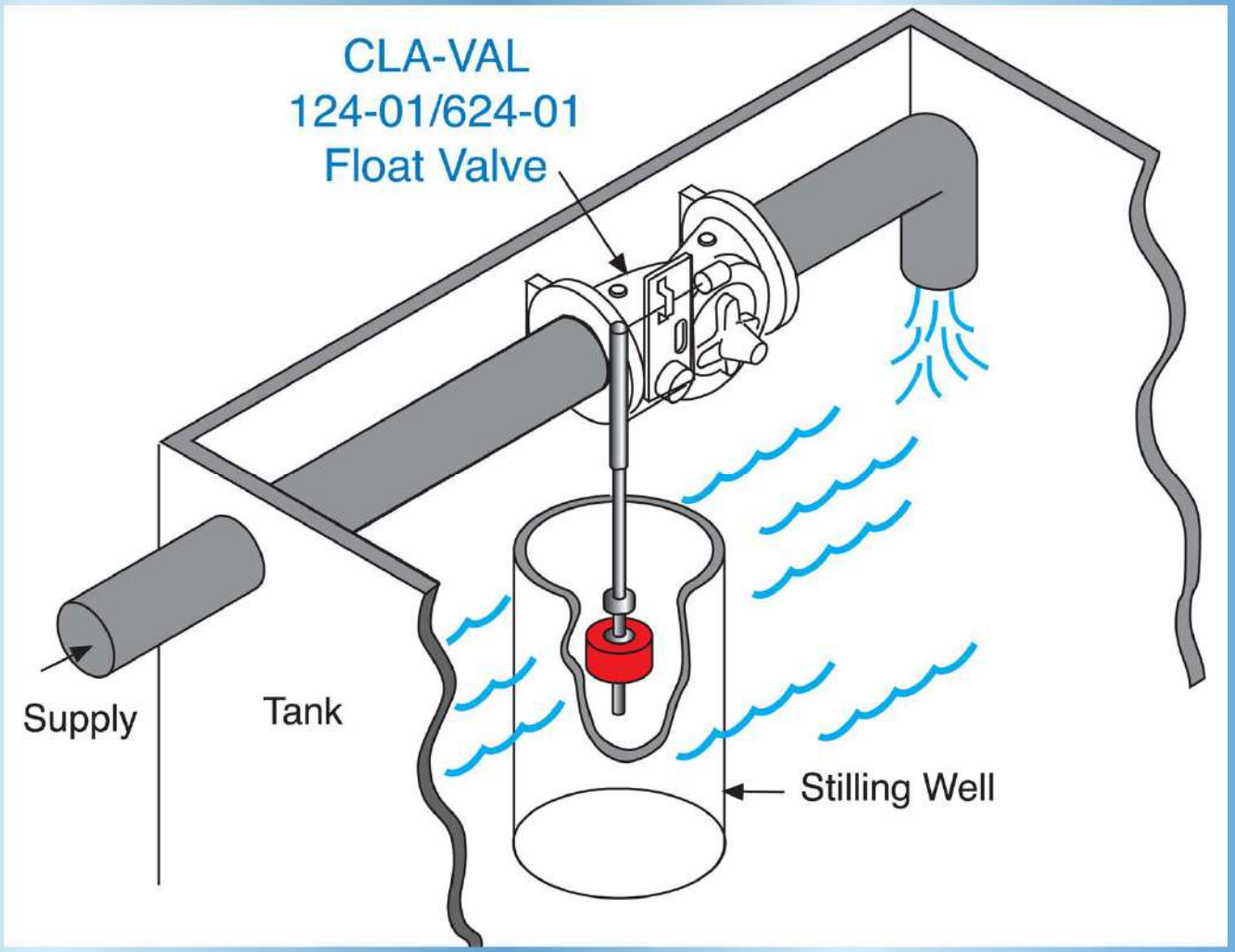
Float Type - 124 Series



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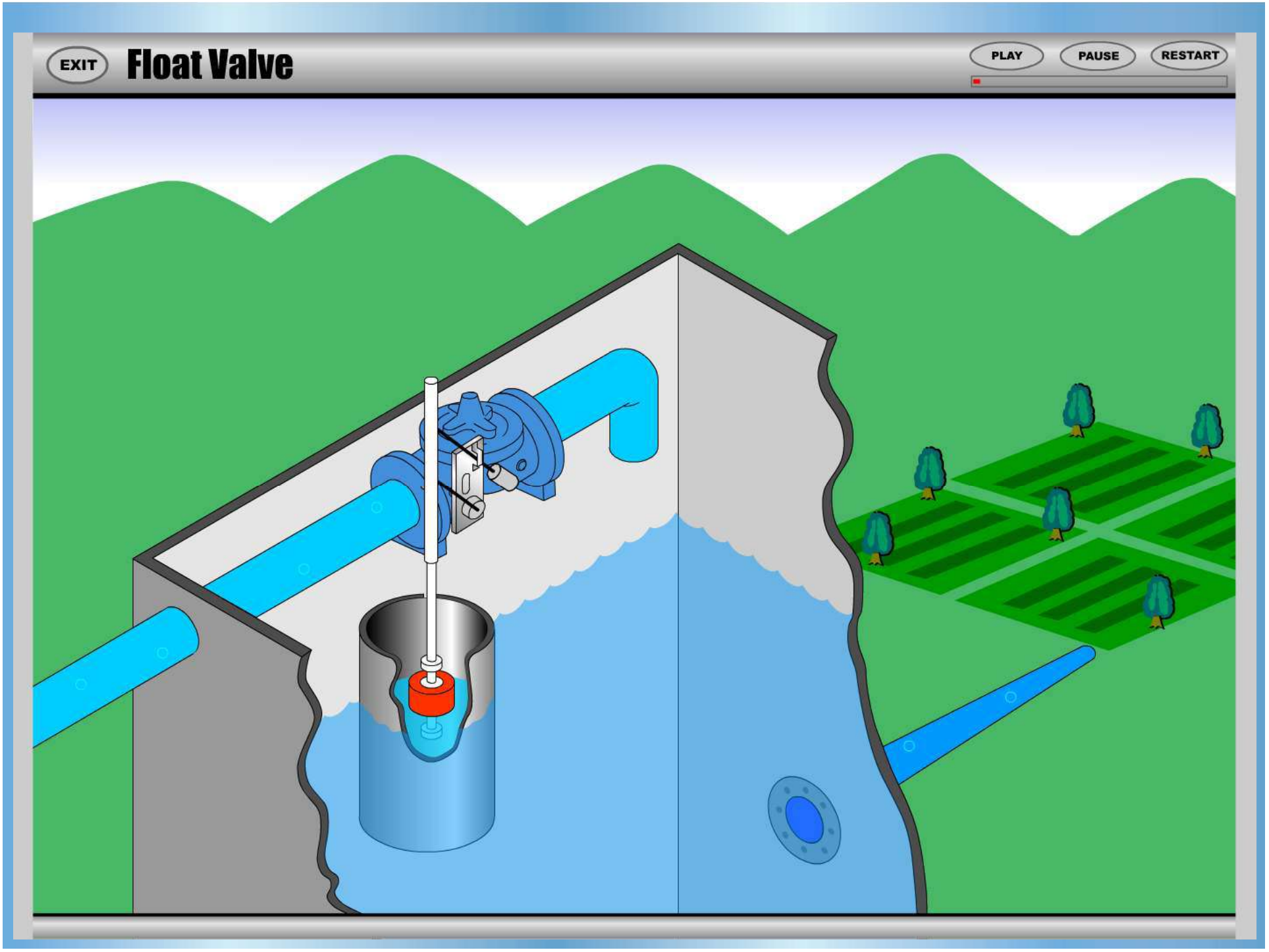

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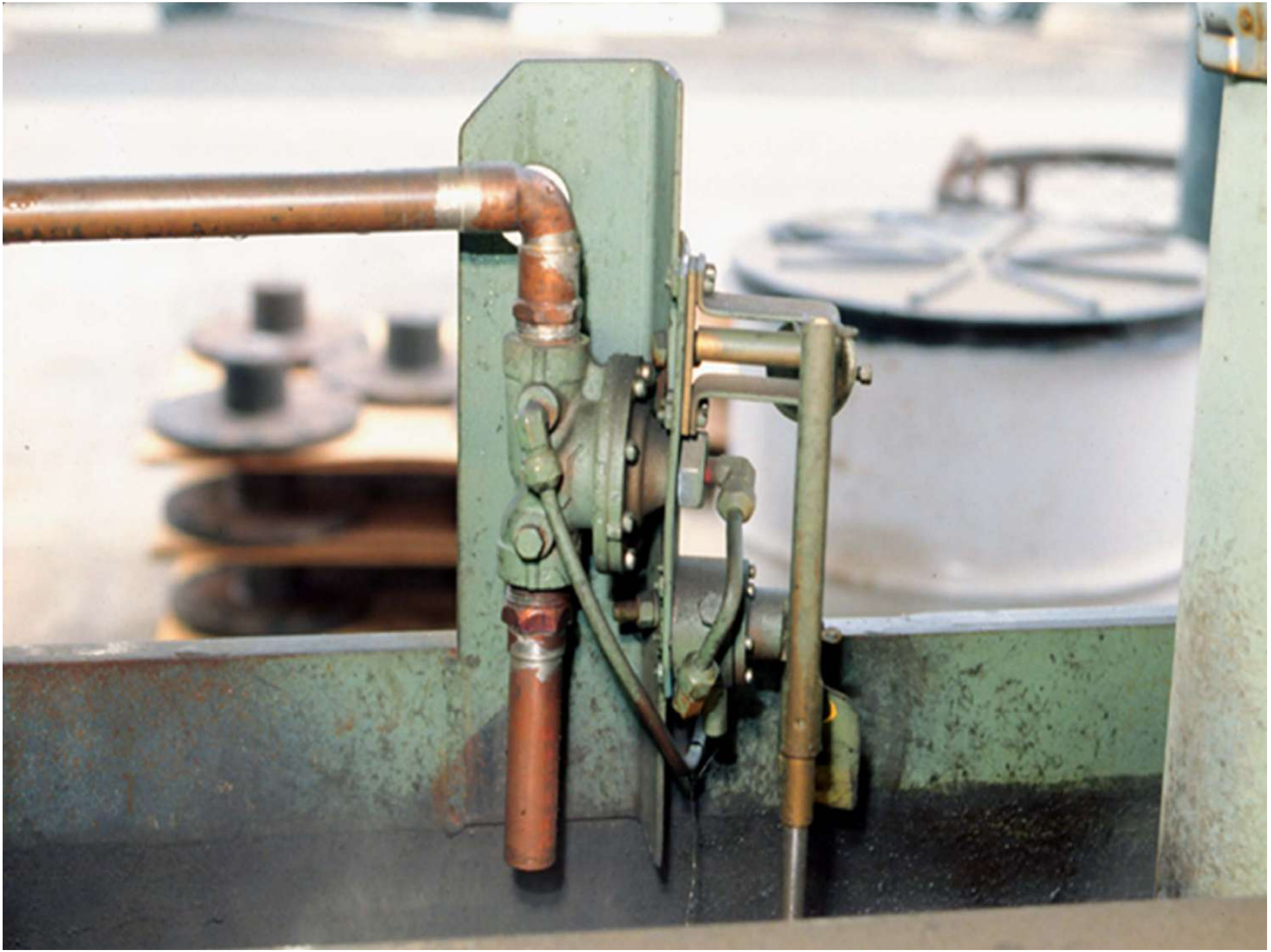

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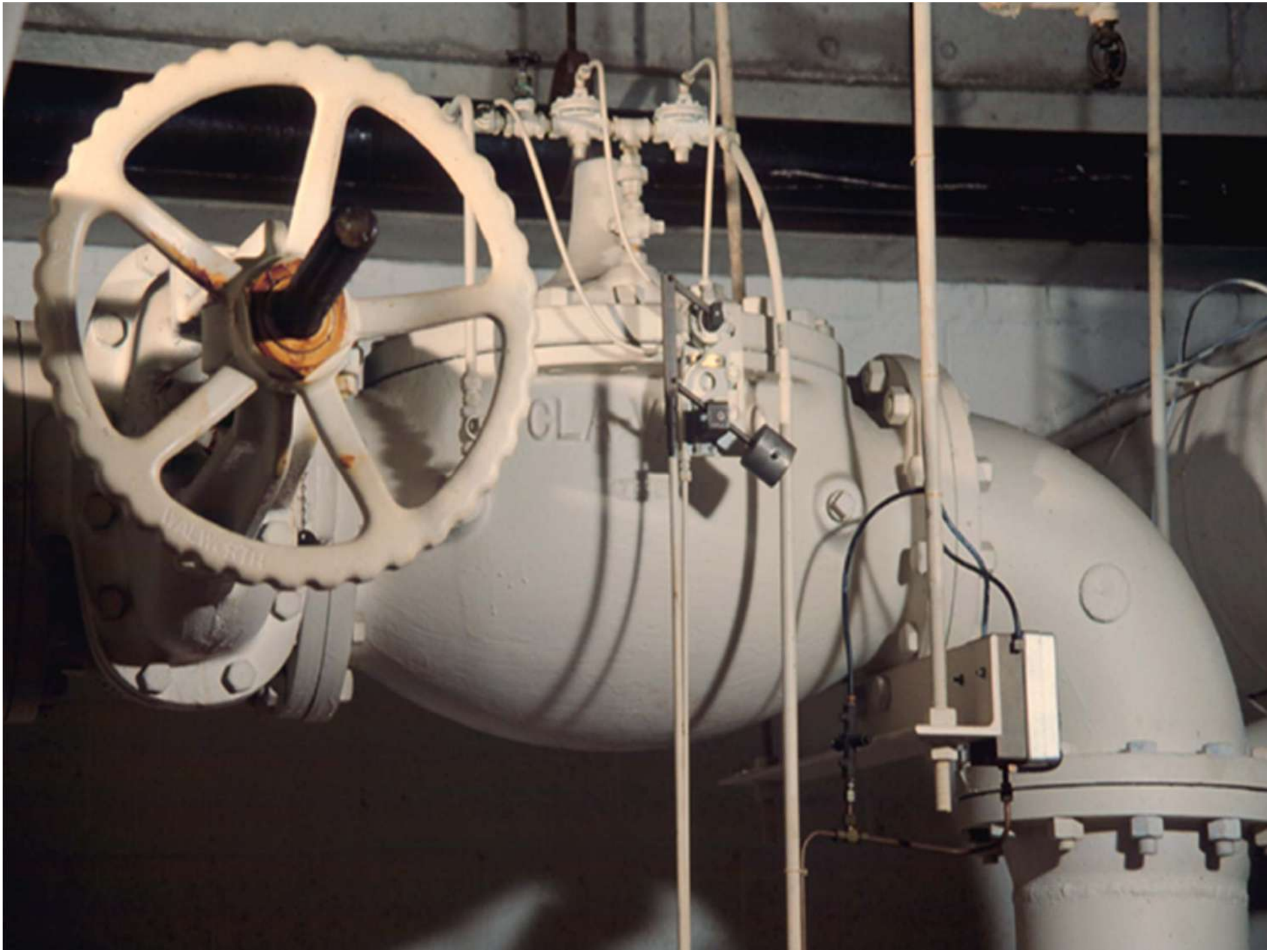

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Combination Valves

Model 92-01 Pressure
Reducing Pressure
Sustaining Control Valve

Model 93-01 Pressure
Reducing and Solenoid
Shut-Off Valve

CLA-VAL

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92-01 Pressure Reducing/ Pressure Sustaining Control Valve

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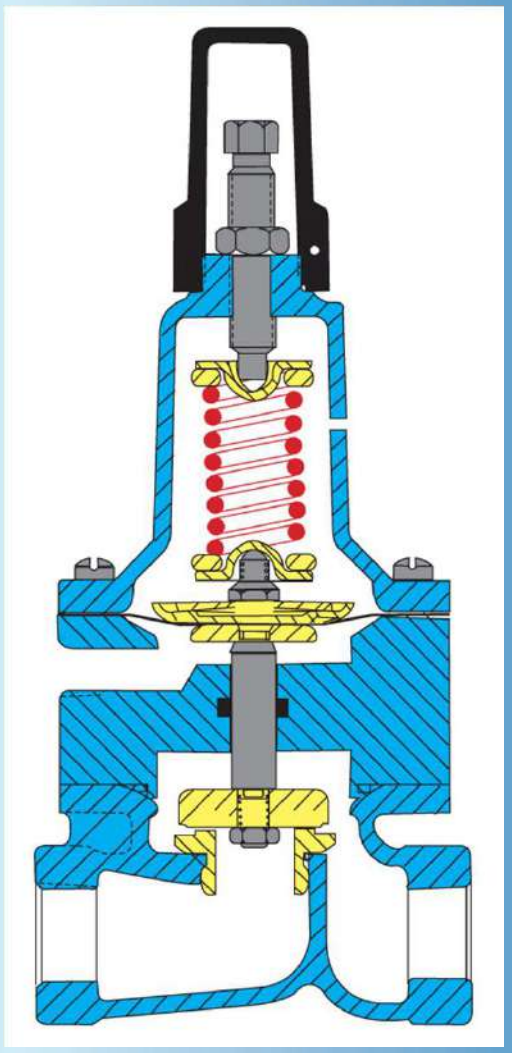
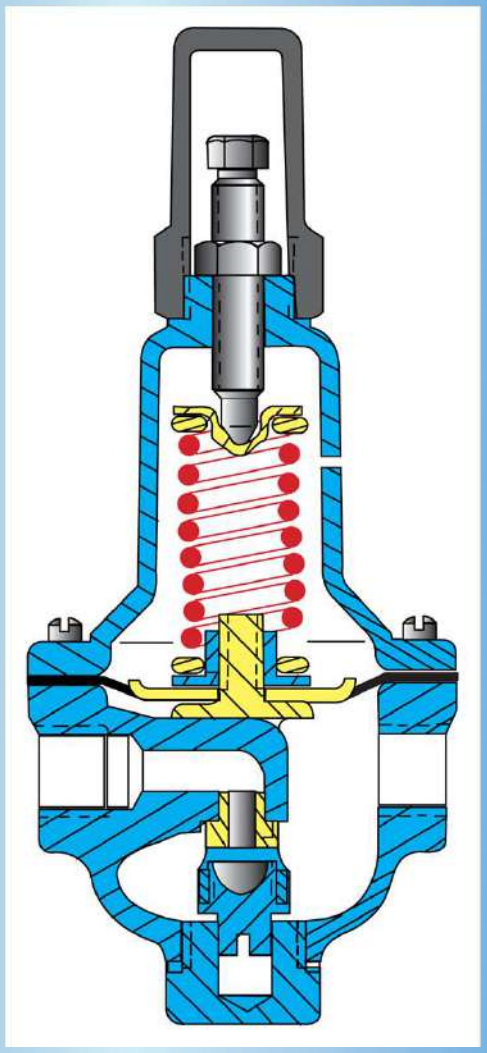
CRL & CRD Comparison





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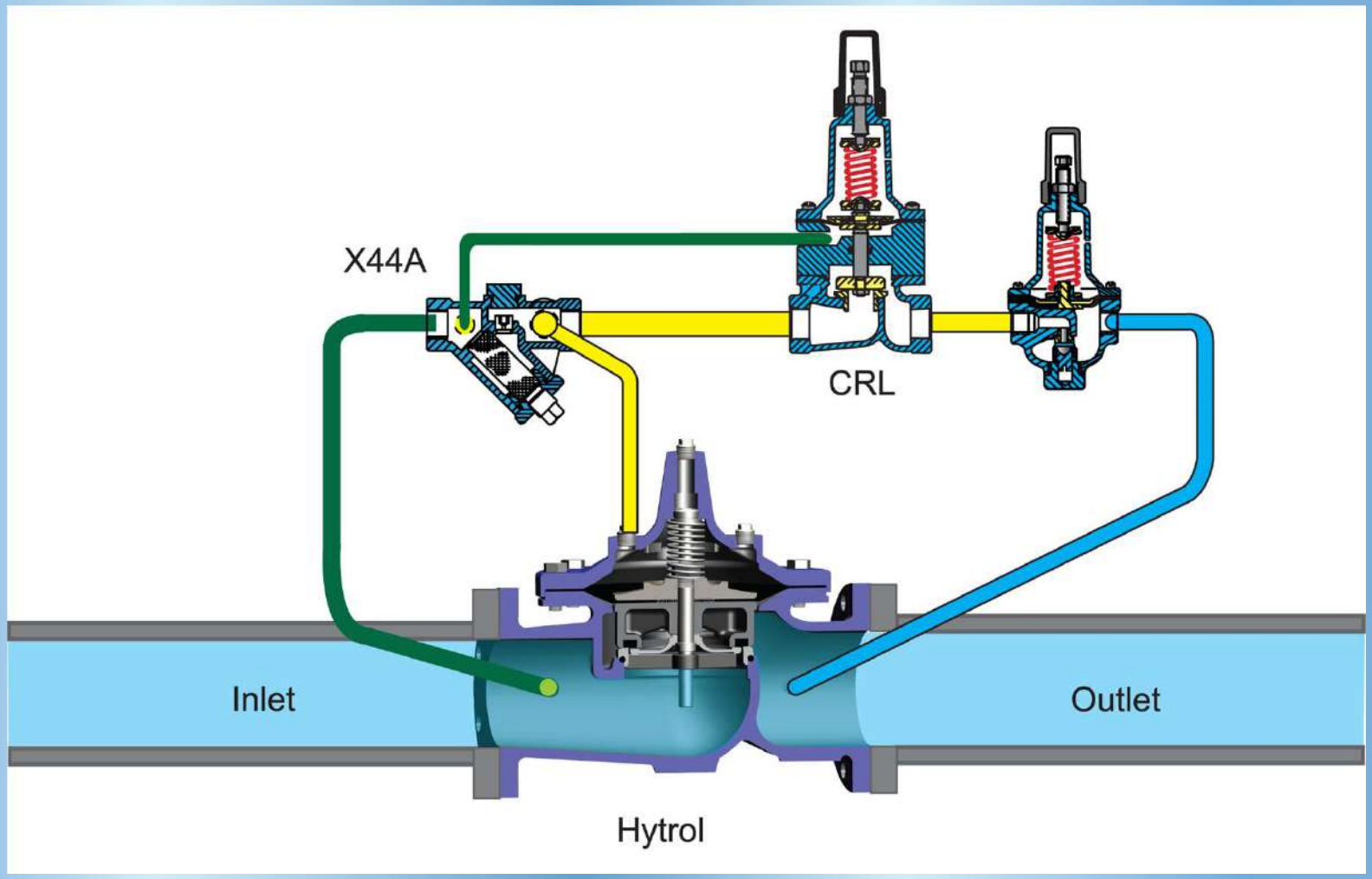
Basic Operation of 92-01 PVS



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Model 93-01 Pressure Reducing and Solenoid Shut-Off Valve

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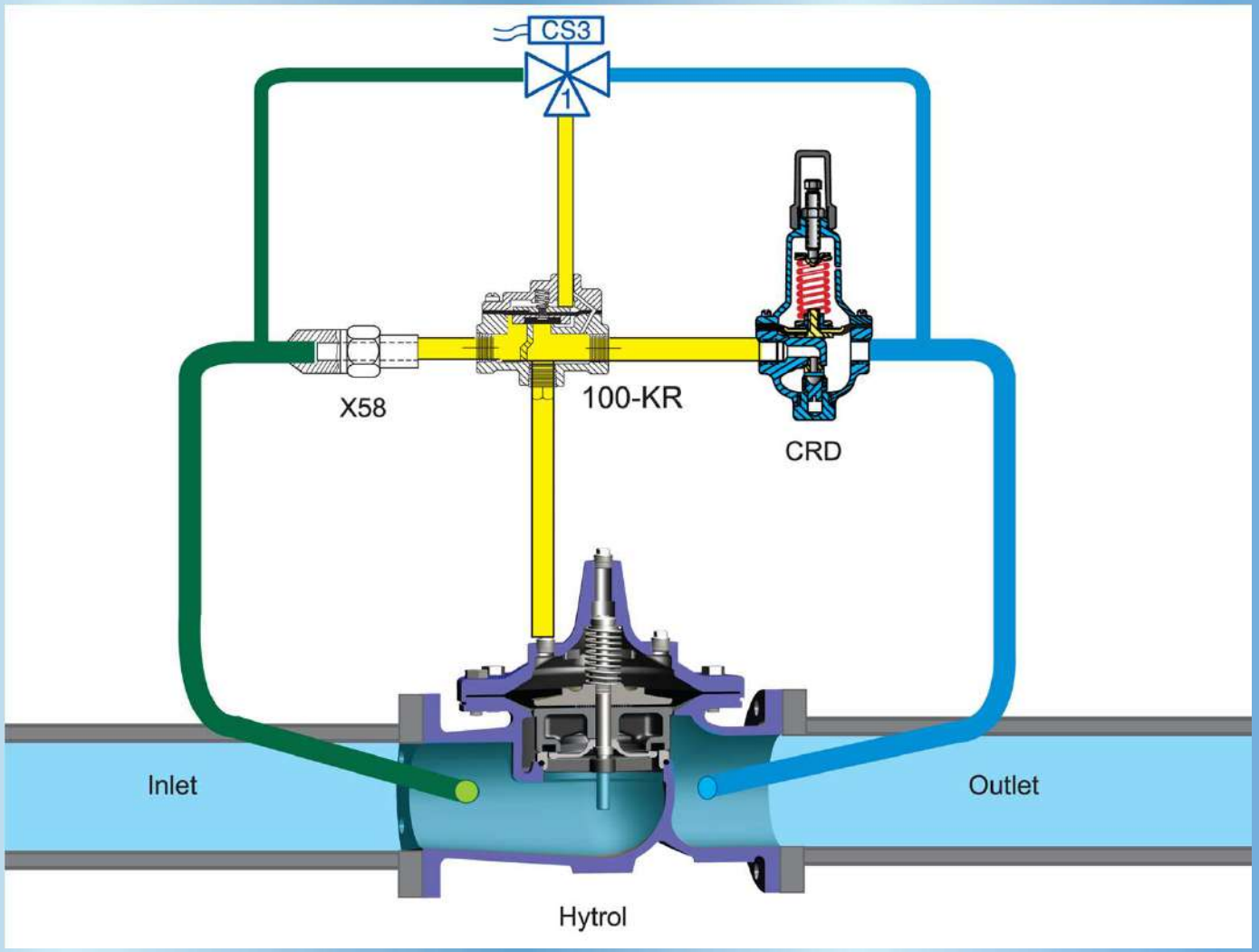
Basic Operation of 93-01 PVS



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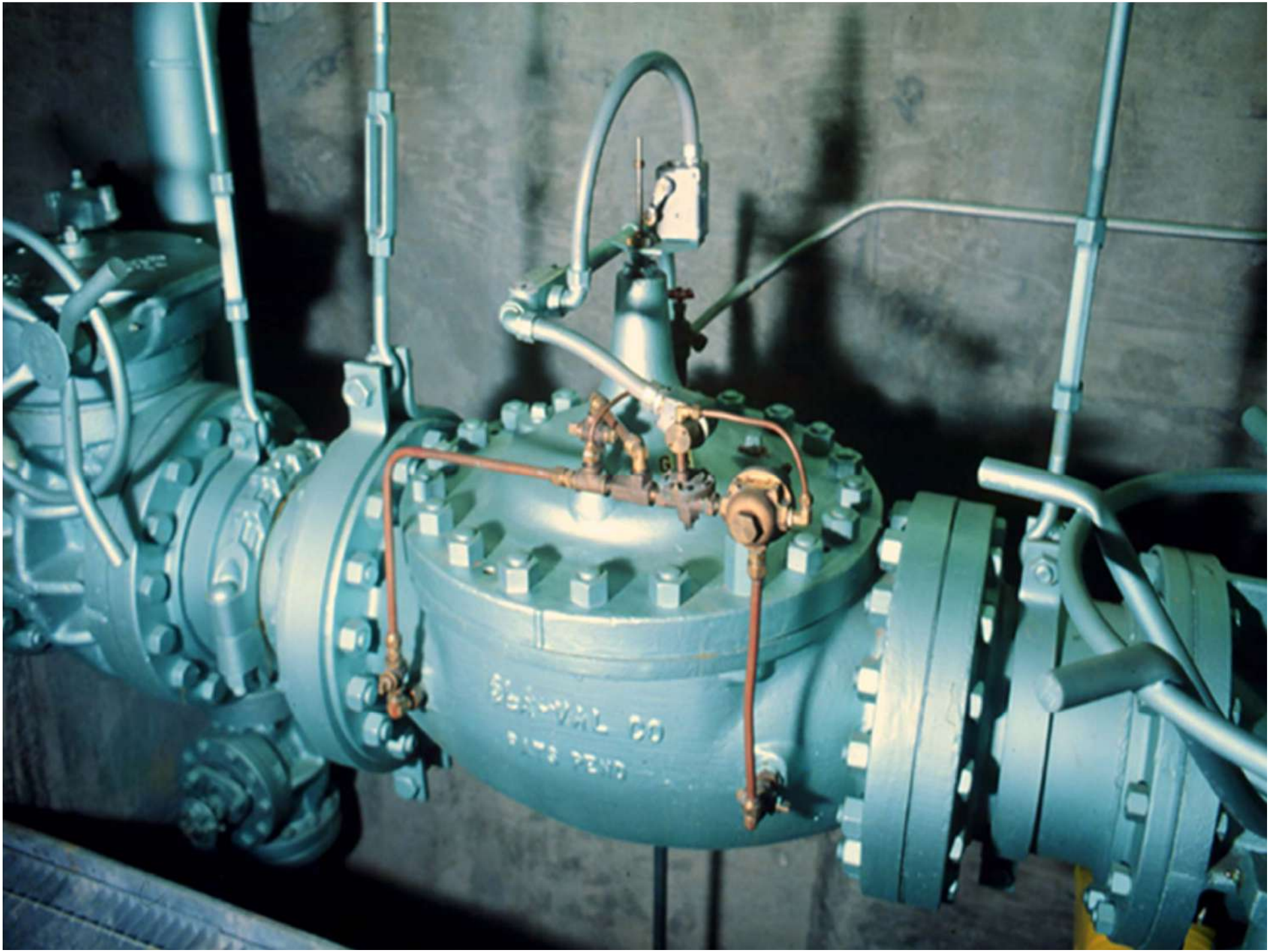

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Remote Control Valves

Model 131-01

Model 350-02

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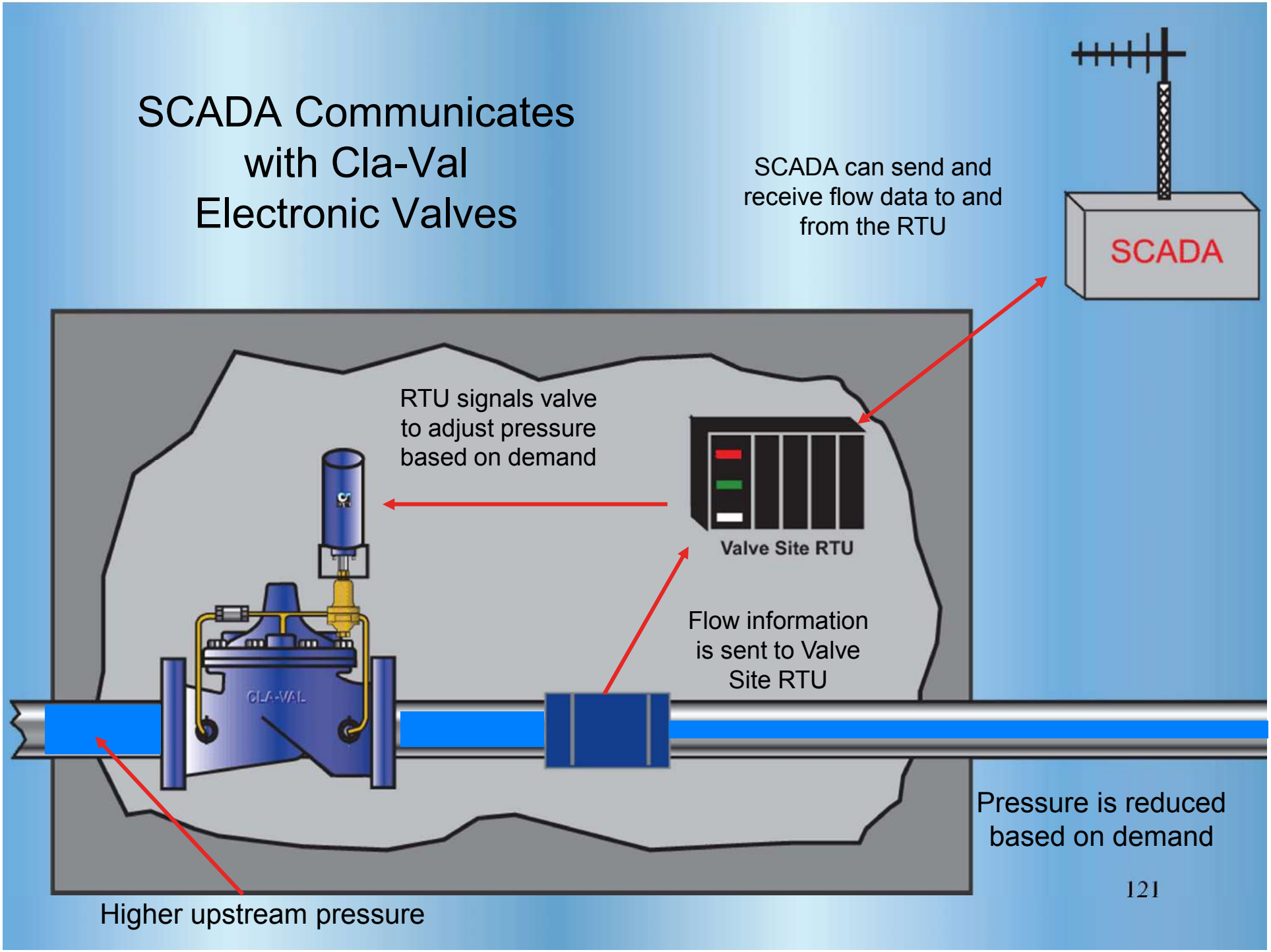
SCADA Communicates with Cla-Val Electronic Valves



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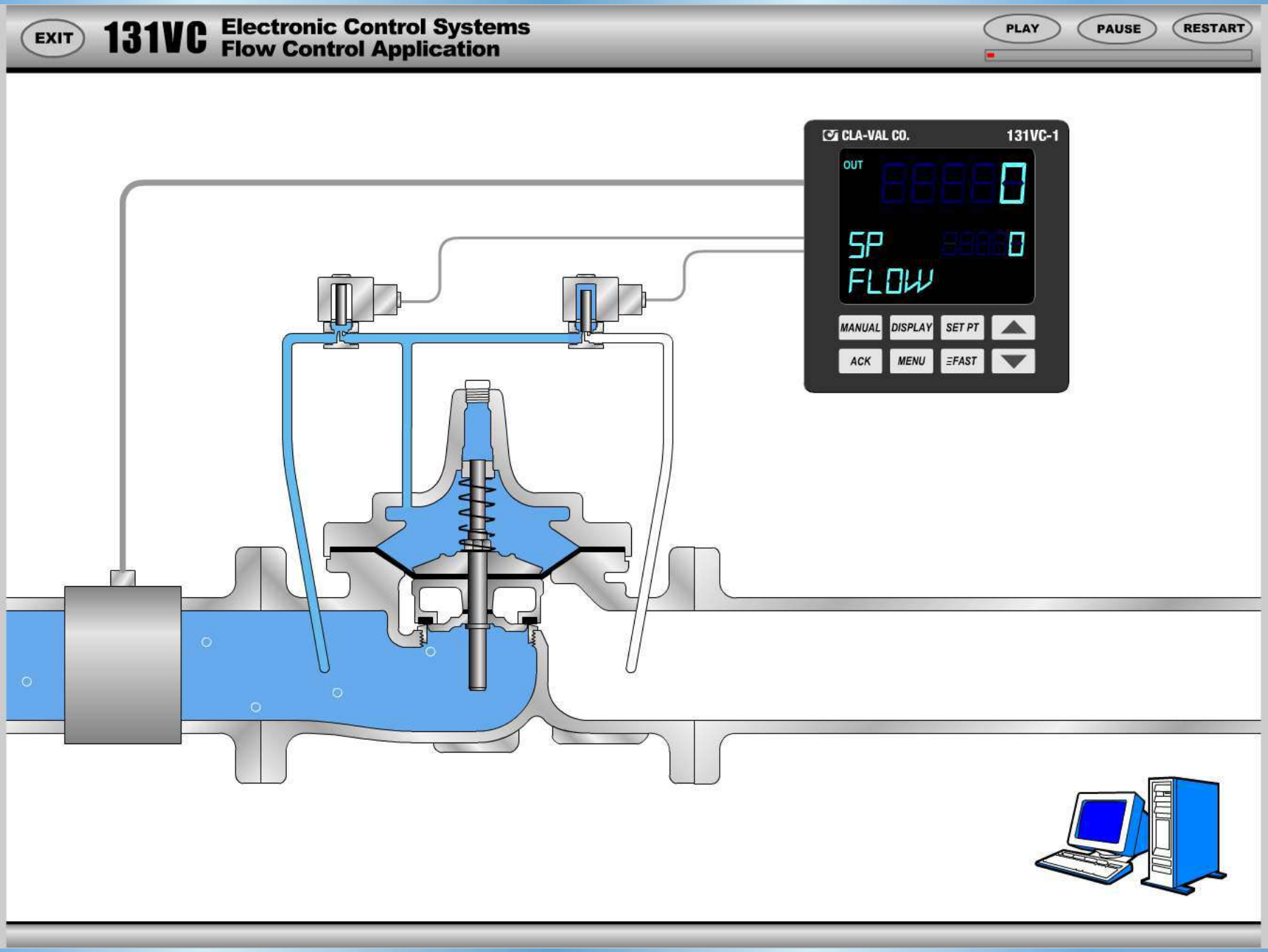

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Cla-Val Series 131 Electronic Valve

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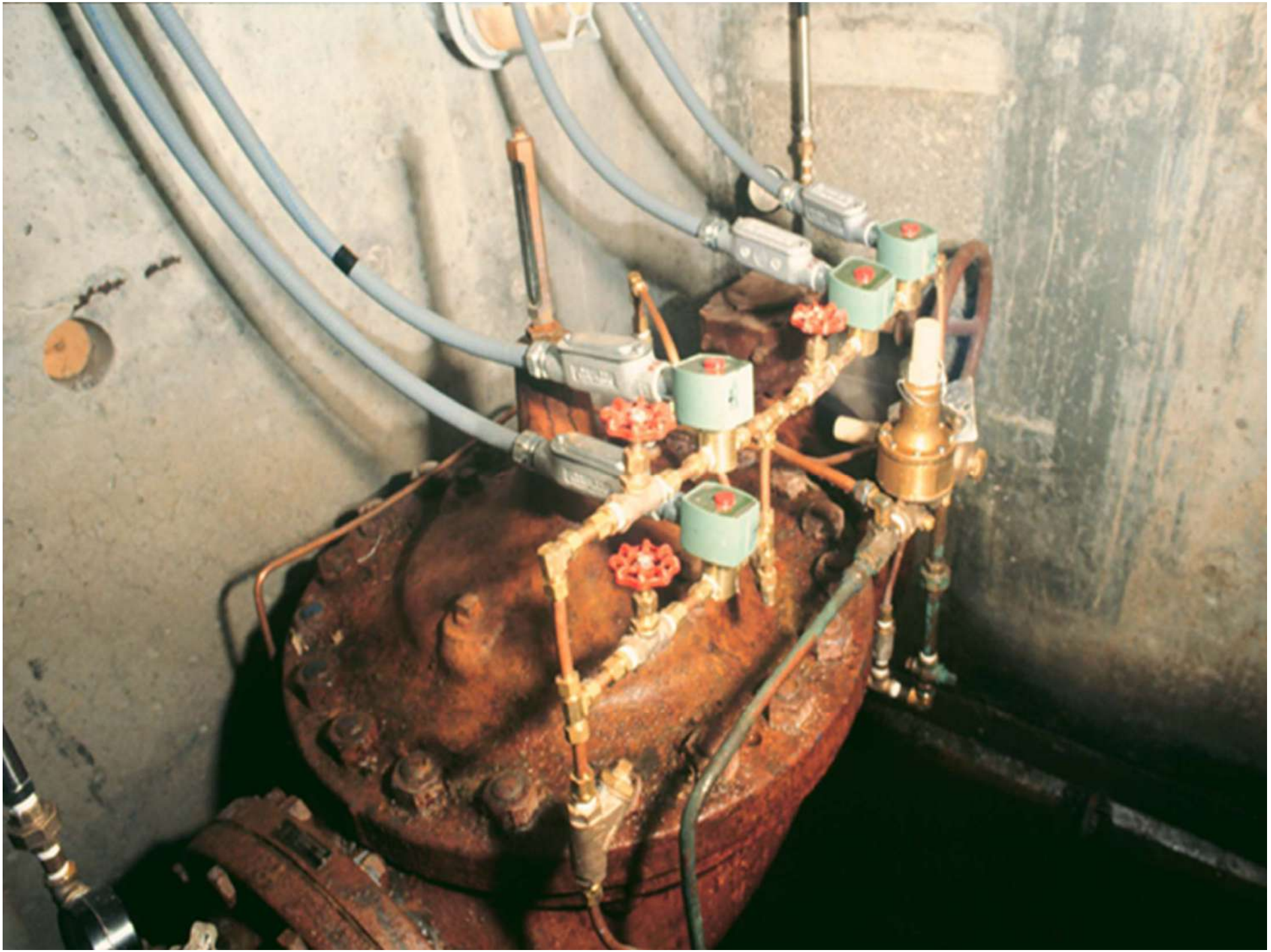

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133-01 Series Metering Valves

Monitors and controls flow

CLA-VAL

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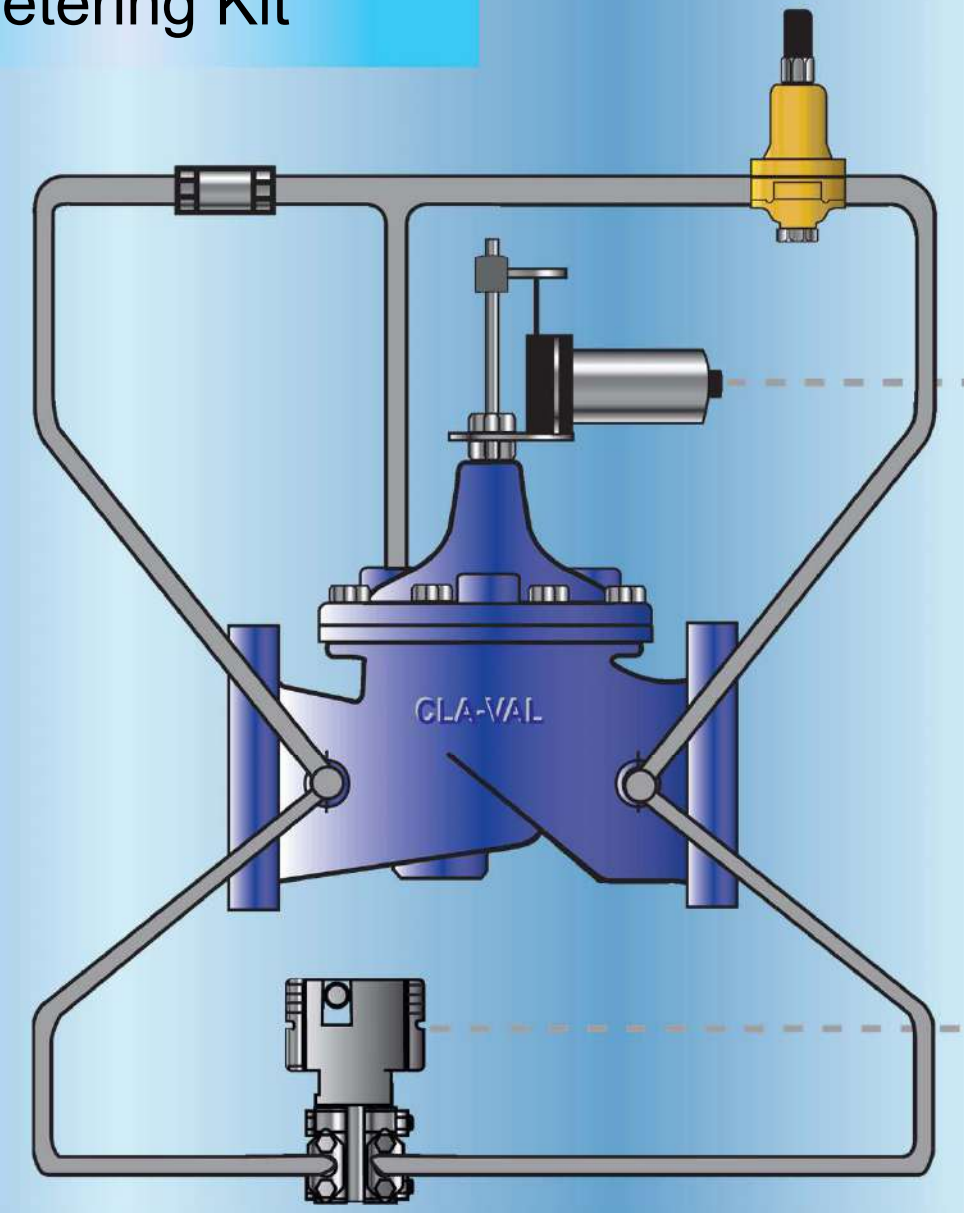
133-01 Flow Metering Kit



Metering Kit Field Installs on Virtually Any Cla-Val Control Valve

Optional Enclosure

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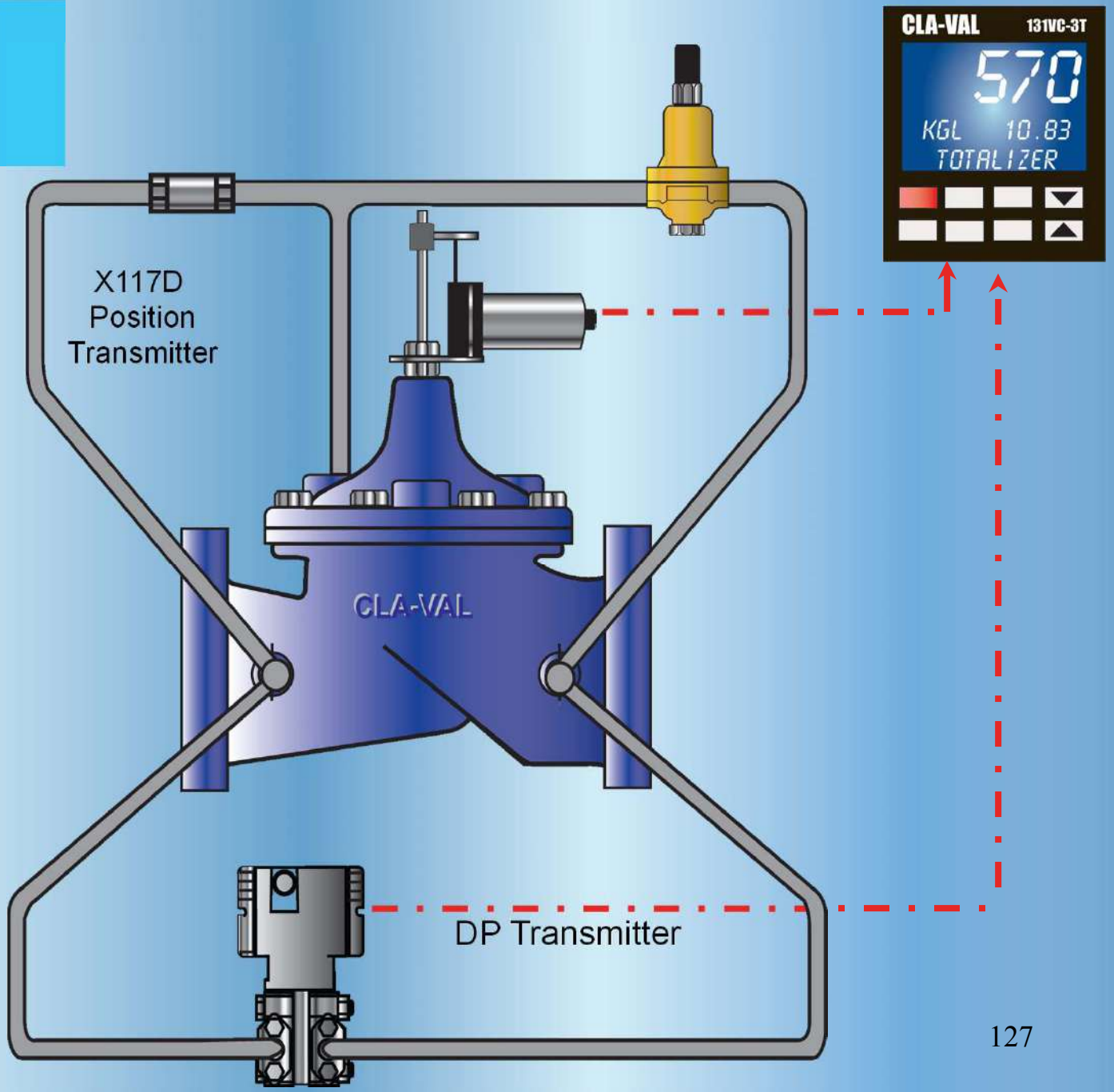
133-01 Flow Metering Kit Components



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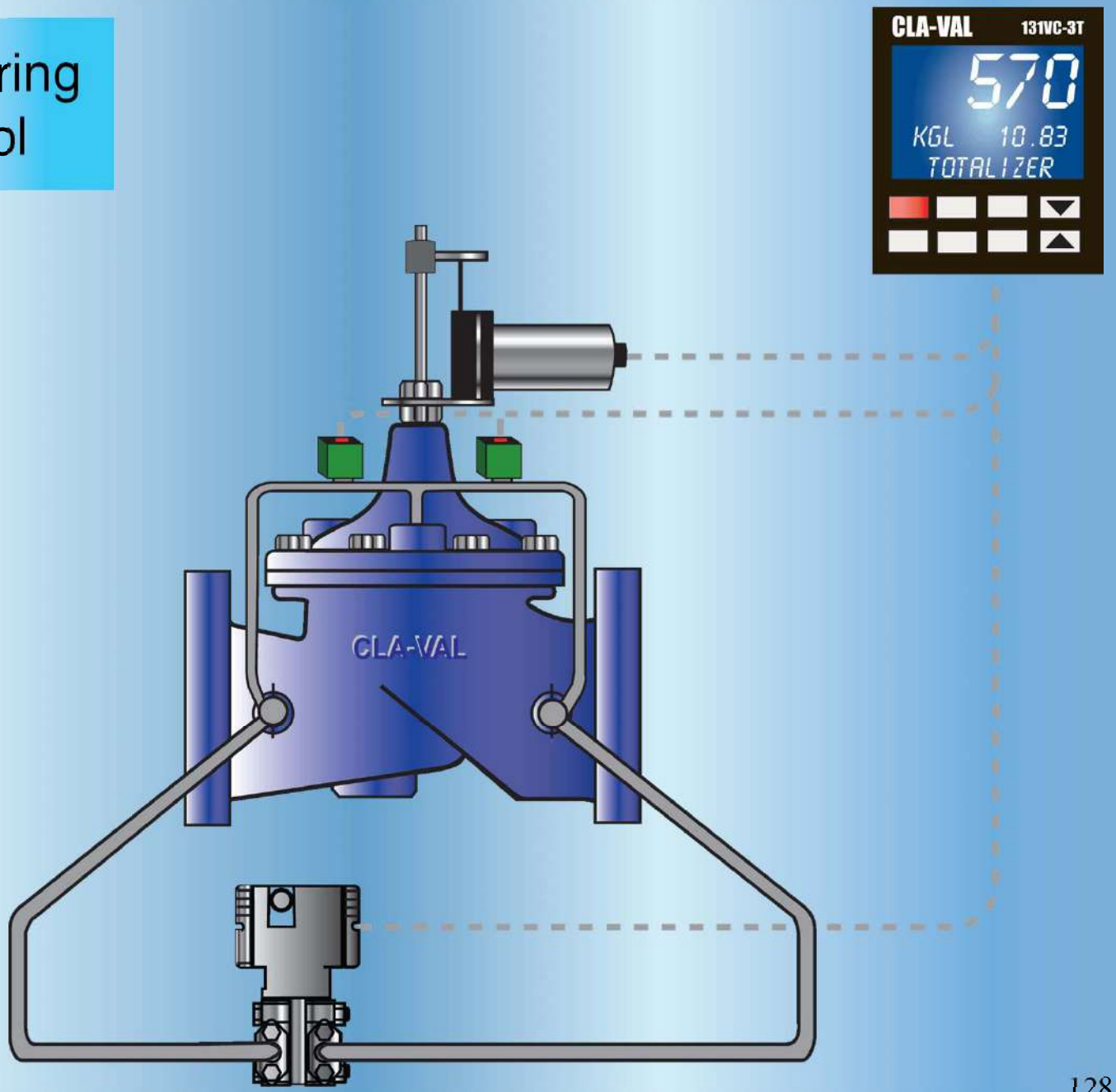
133-01 Metering with Control



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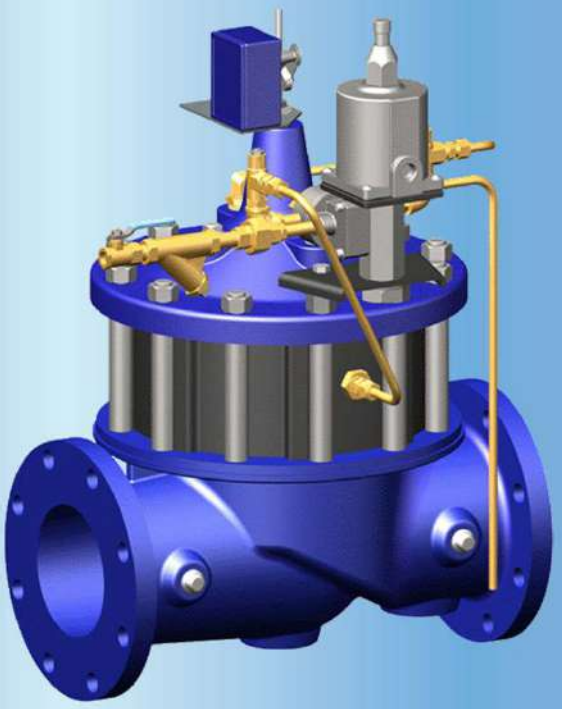
Pump Control Valves

Model 60-11



Model 61-02

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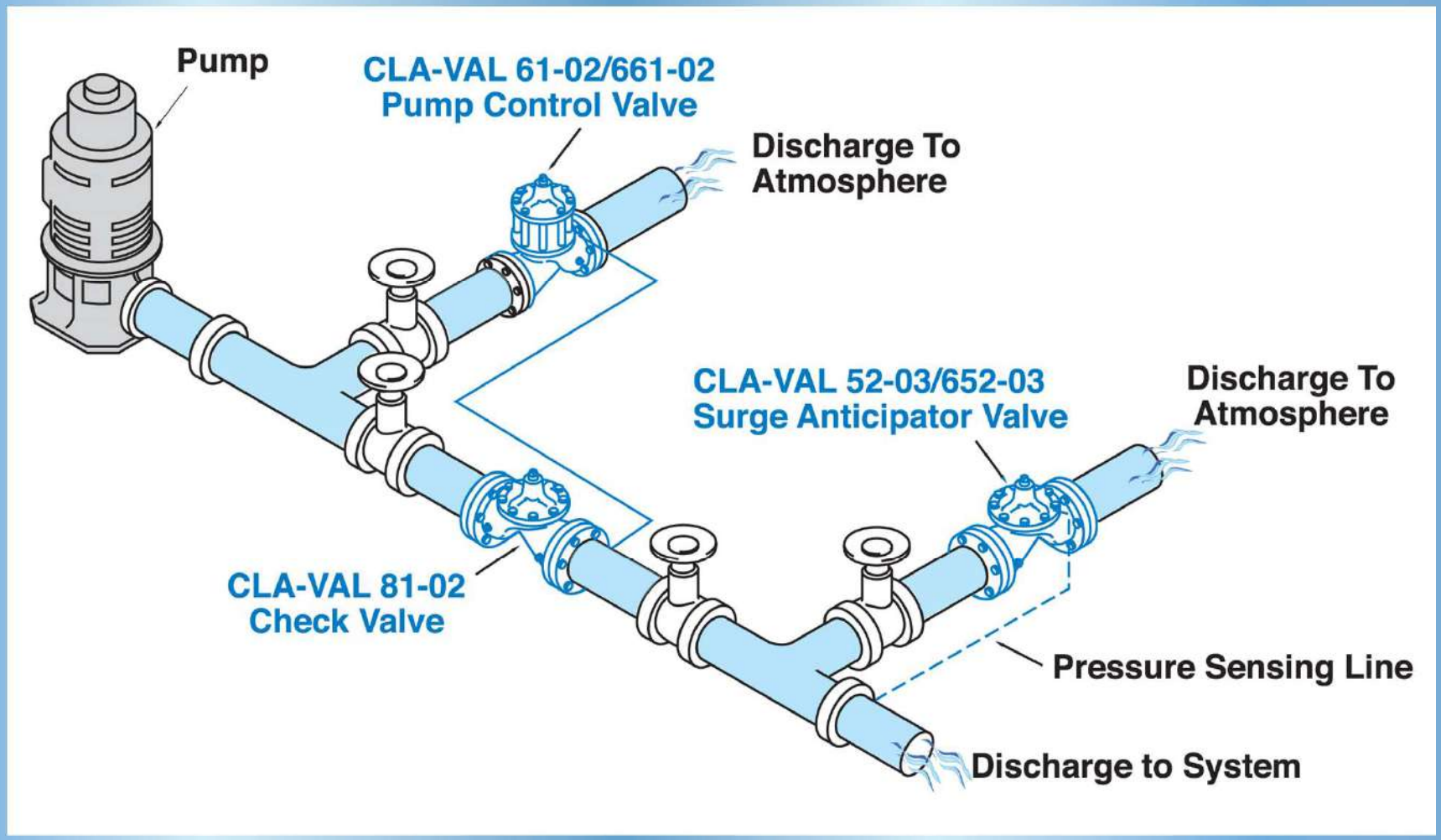
Typical Deep Well Pump Station



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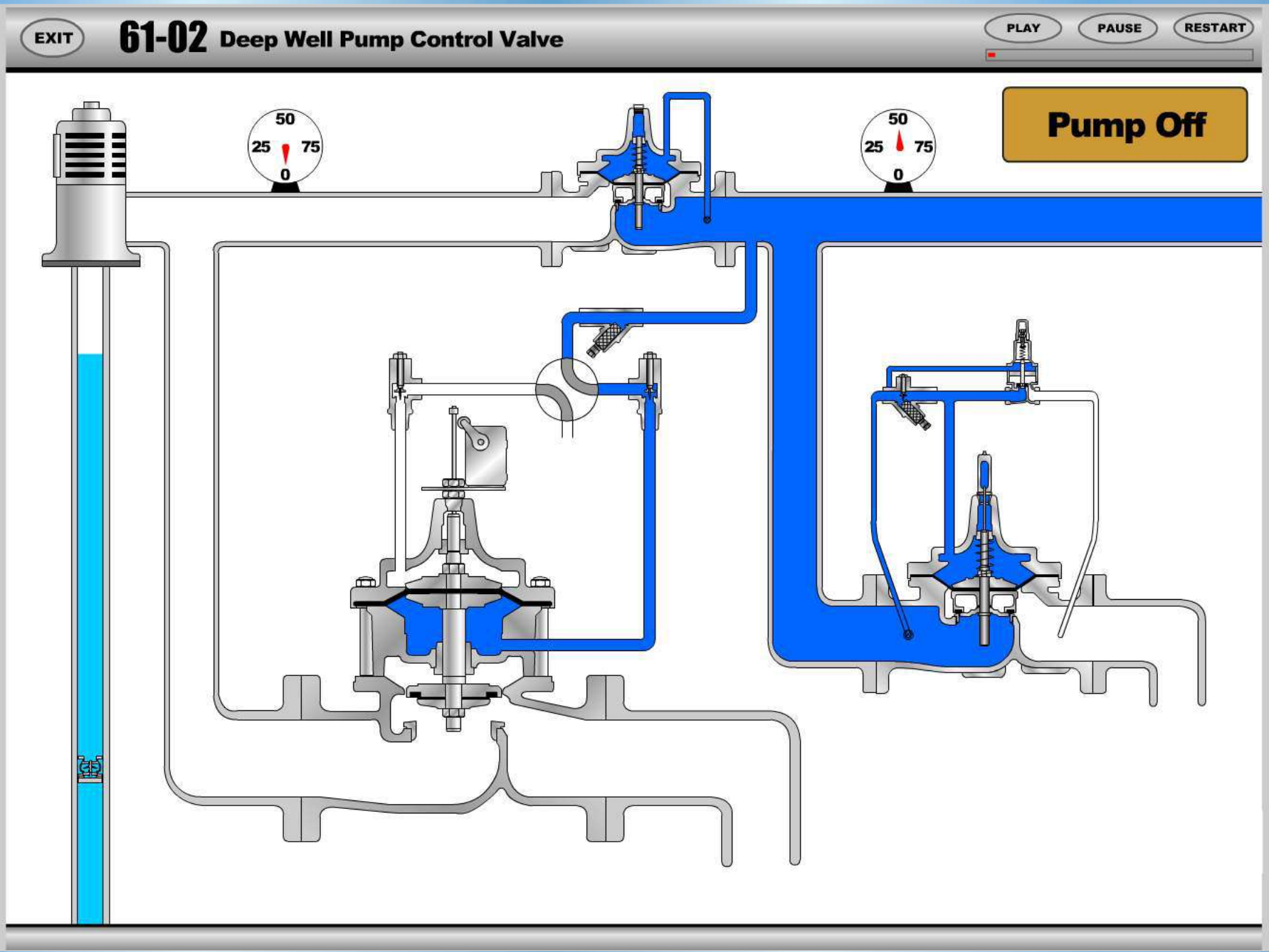

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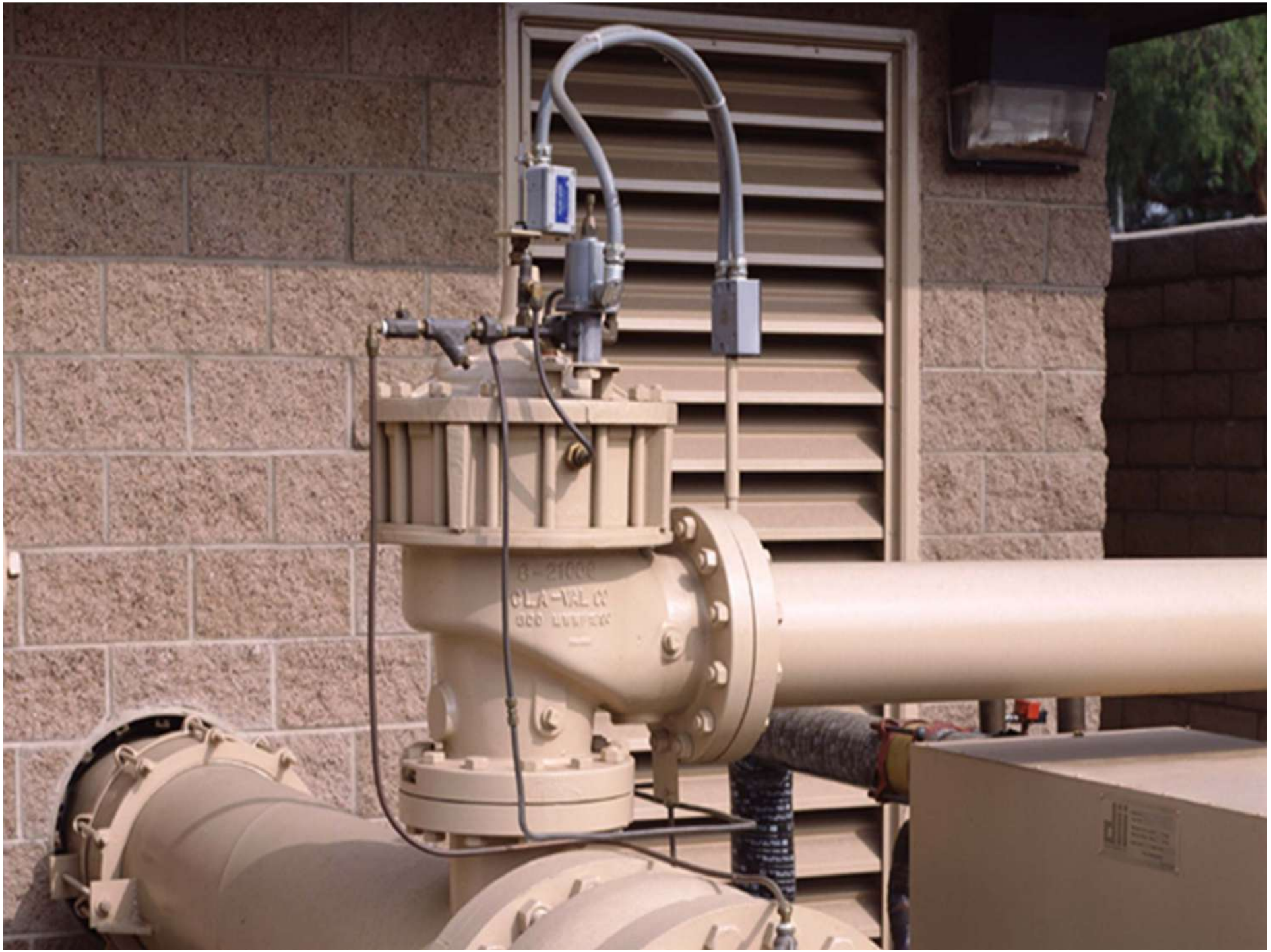

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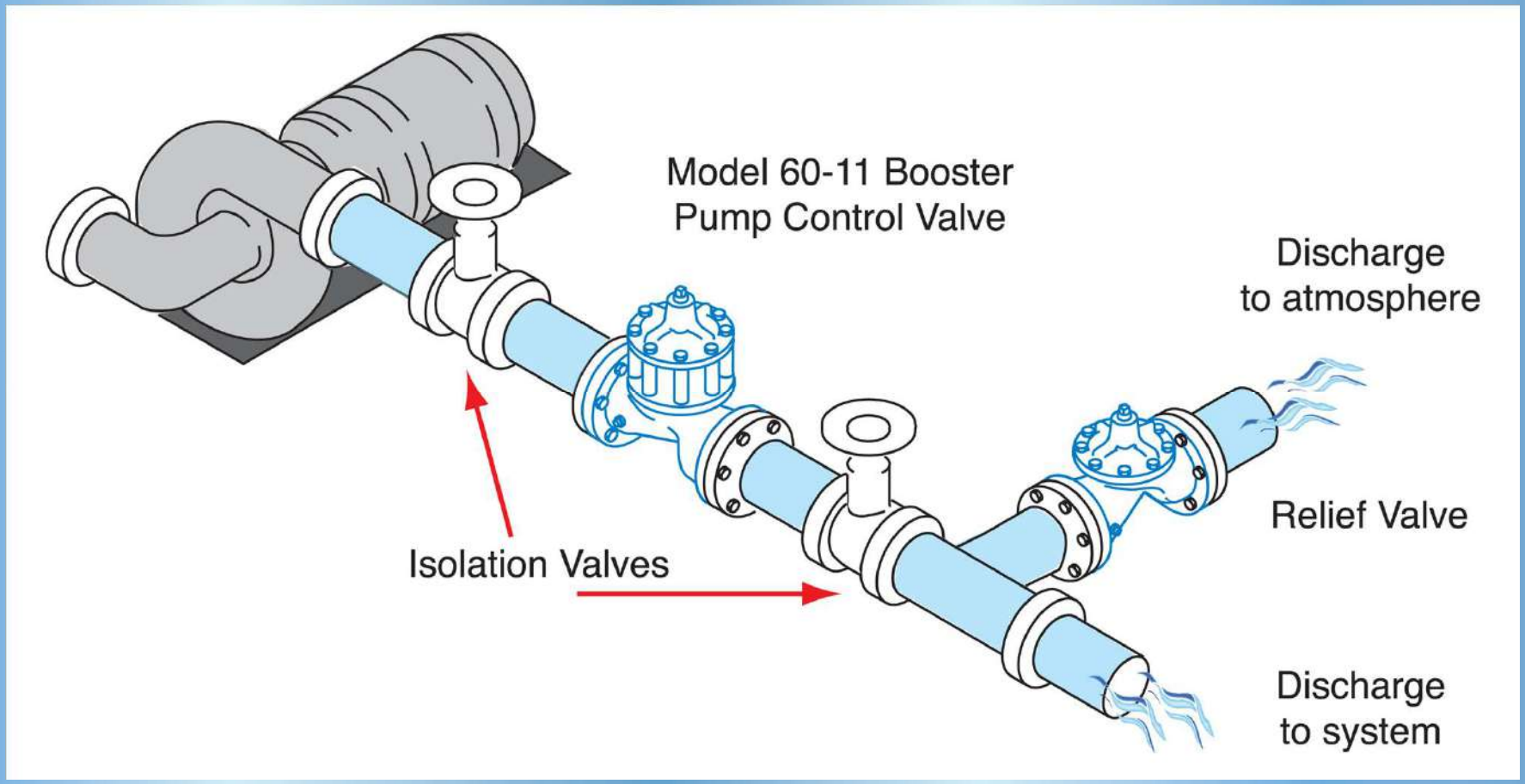
Booster Pump Control Application - Series 60



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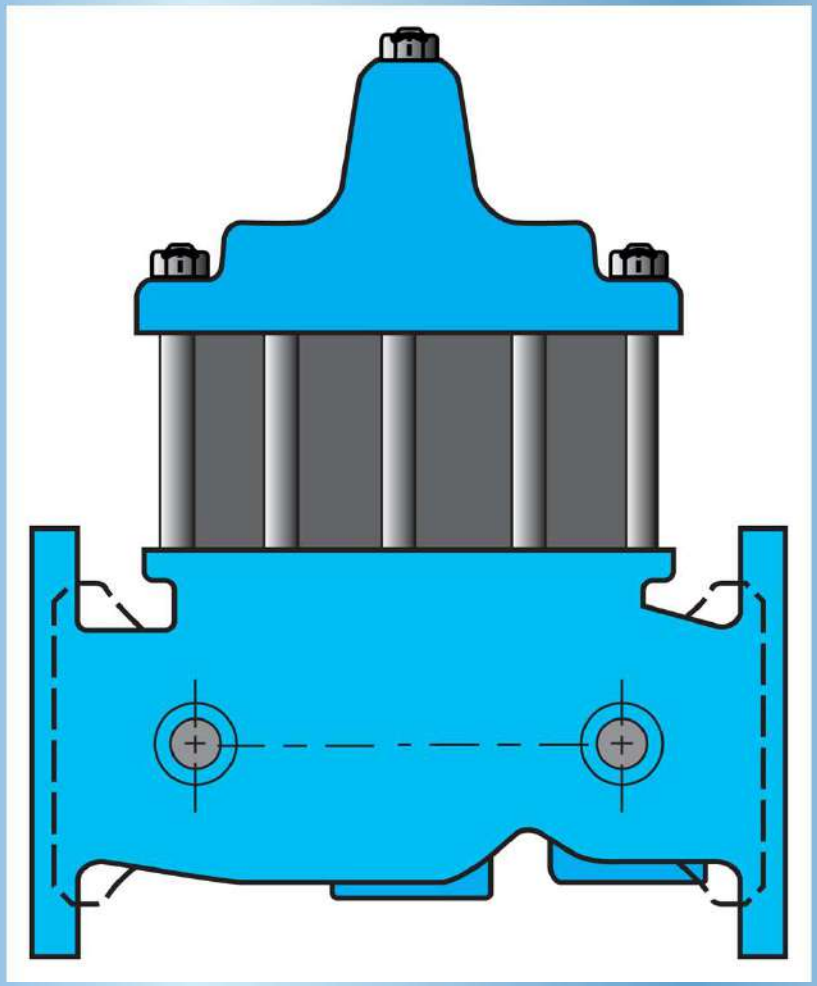
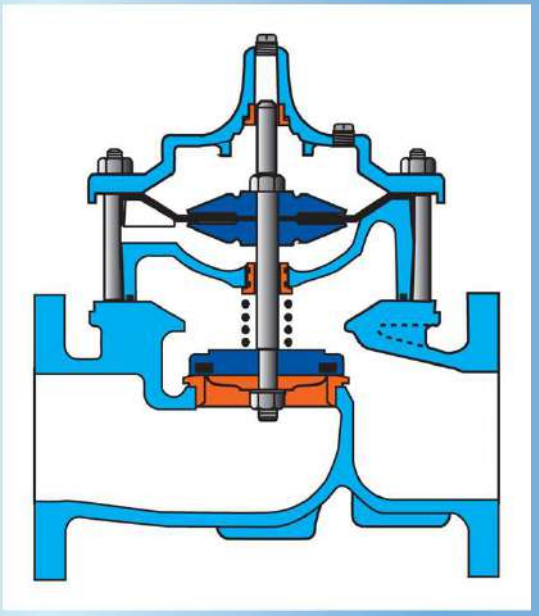
Powercheck Main Valve



Model 100-03
Built-In lift type
check valve



Spring in cover 10″ and smaller

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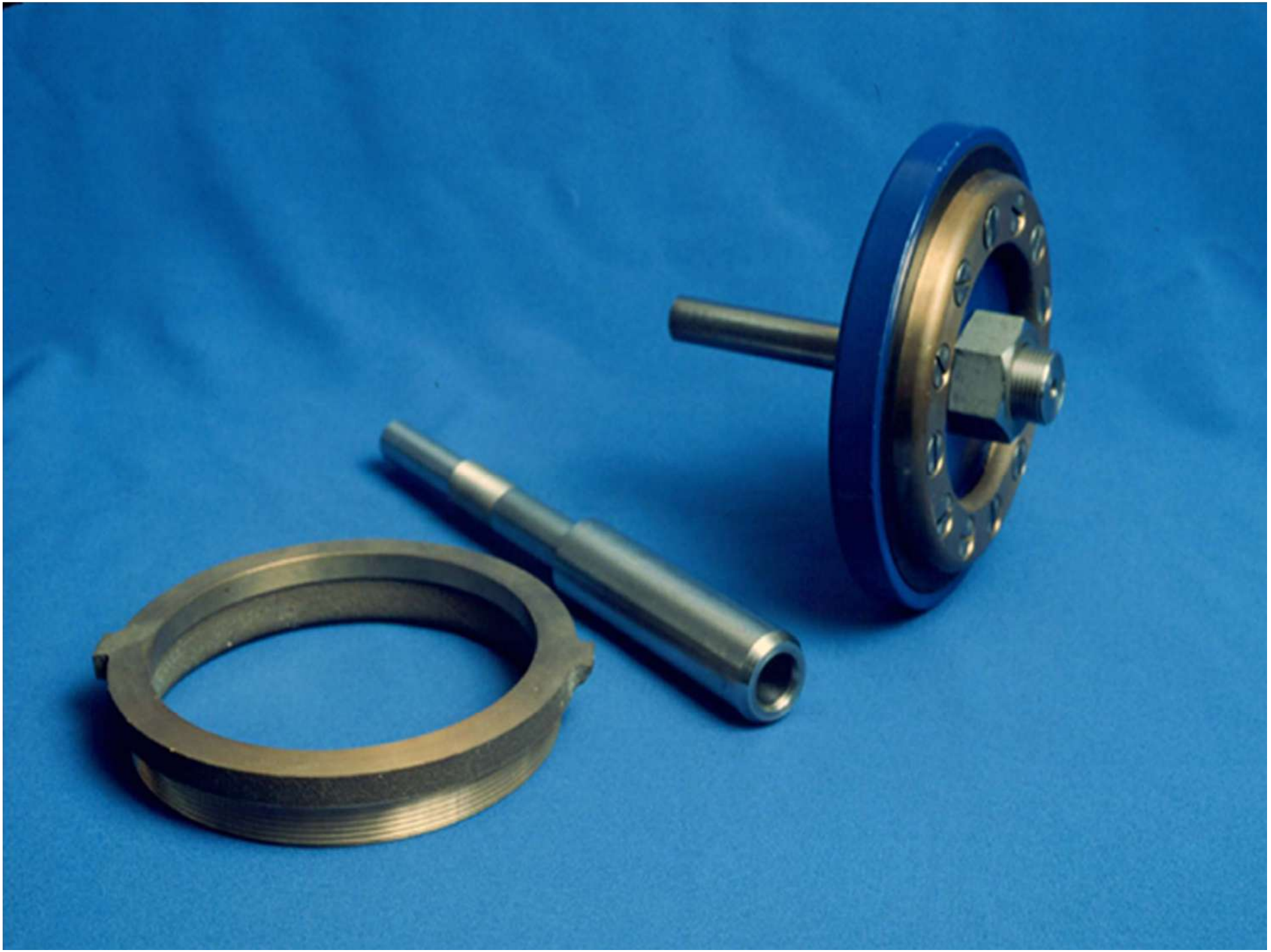

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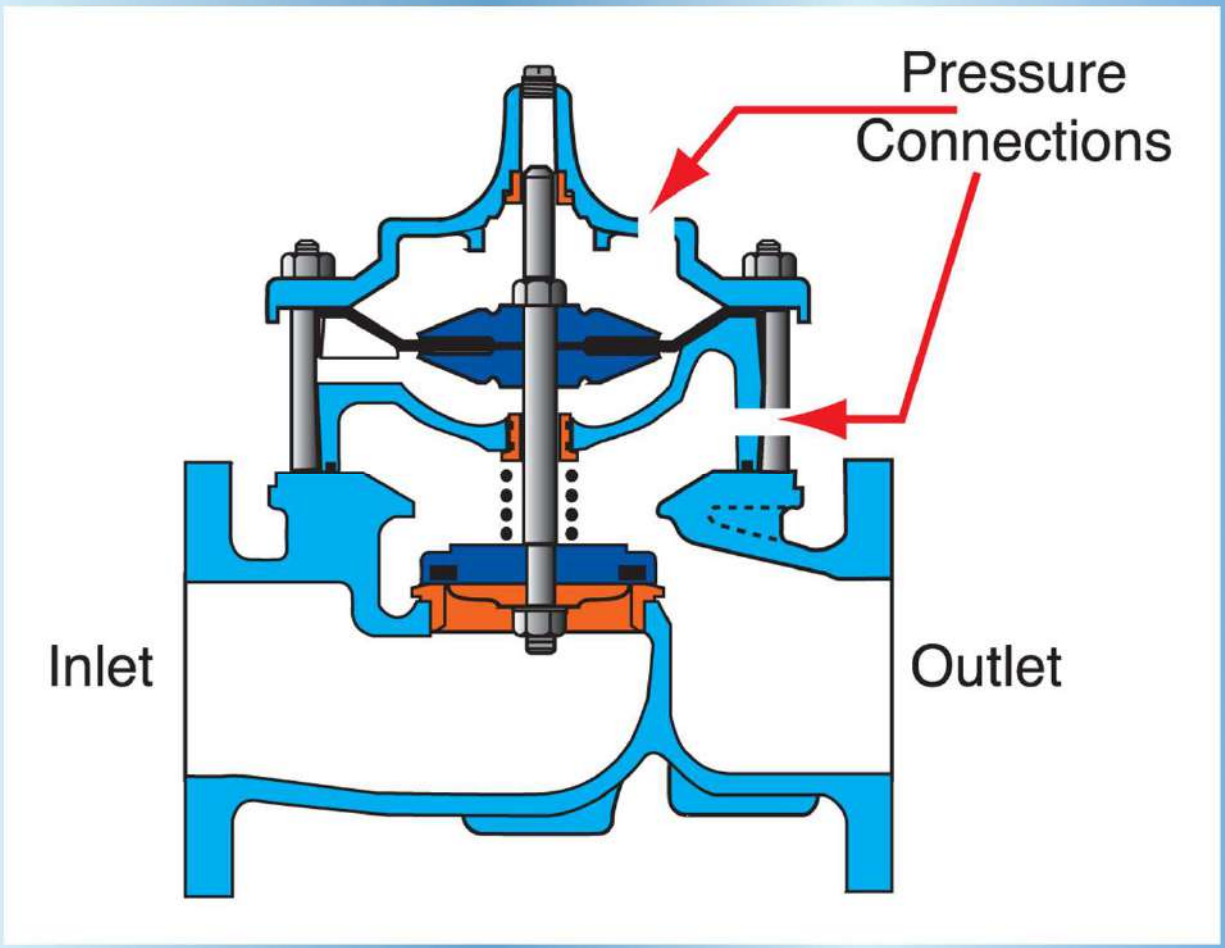
Powercheck Components - Location and Function



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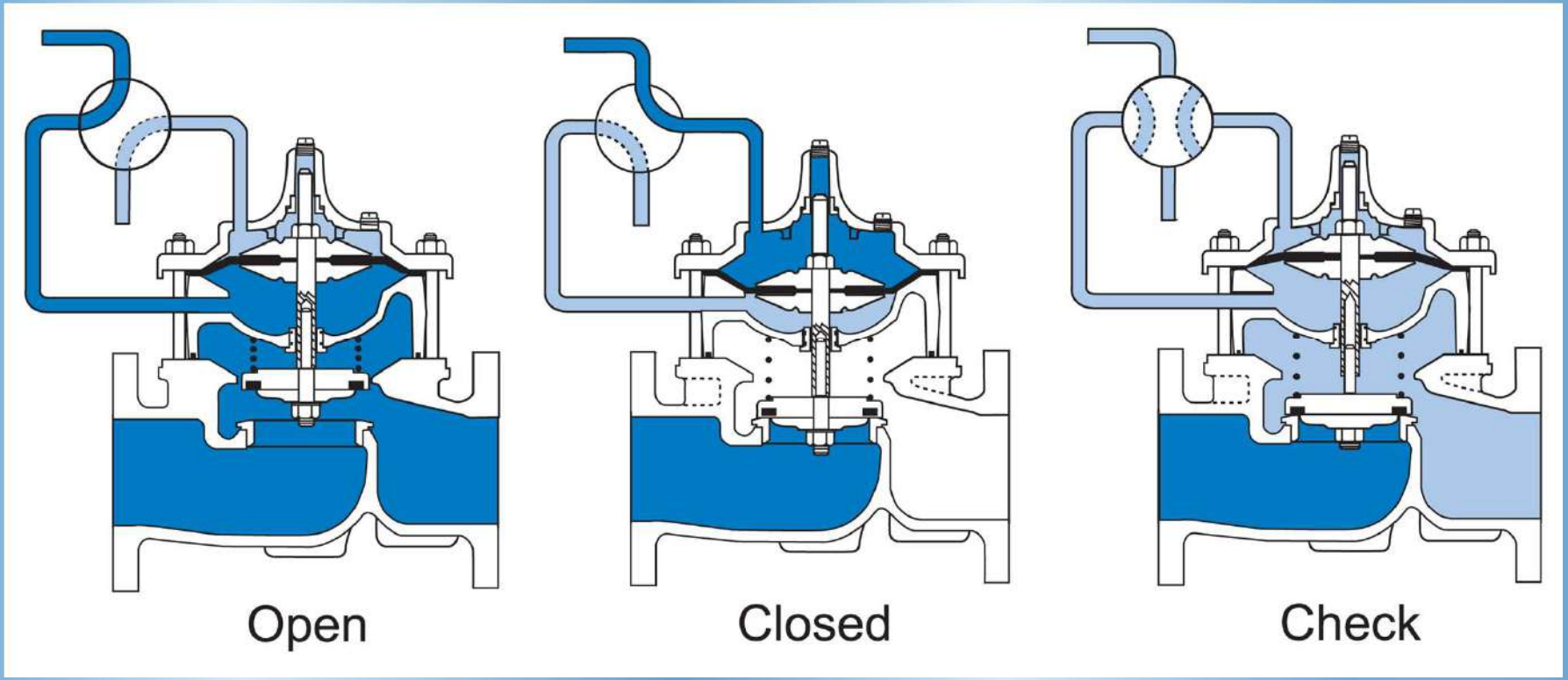
Operation Theory: Open, Closed, Check



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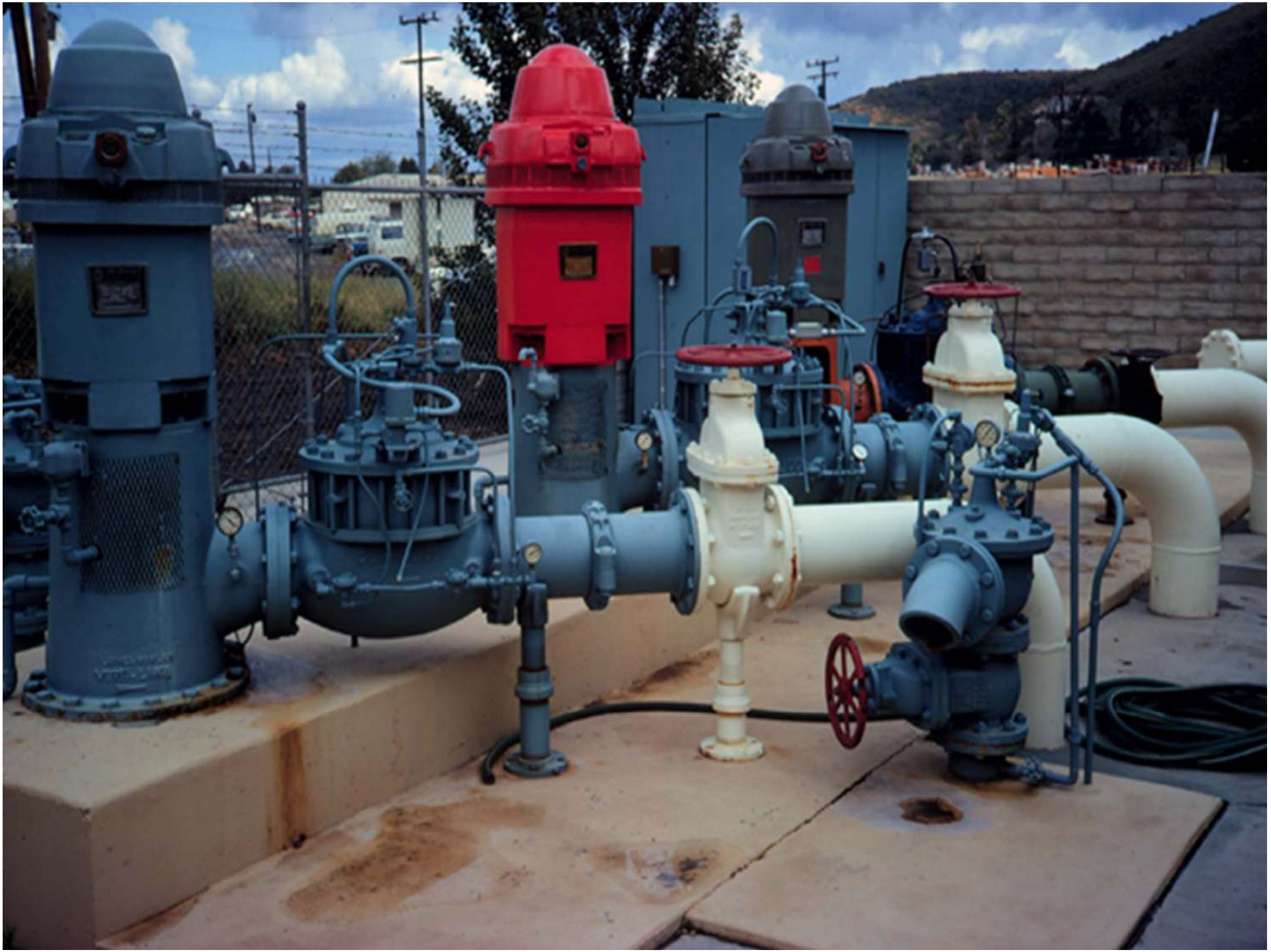

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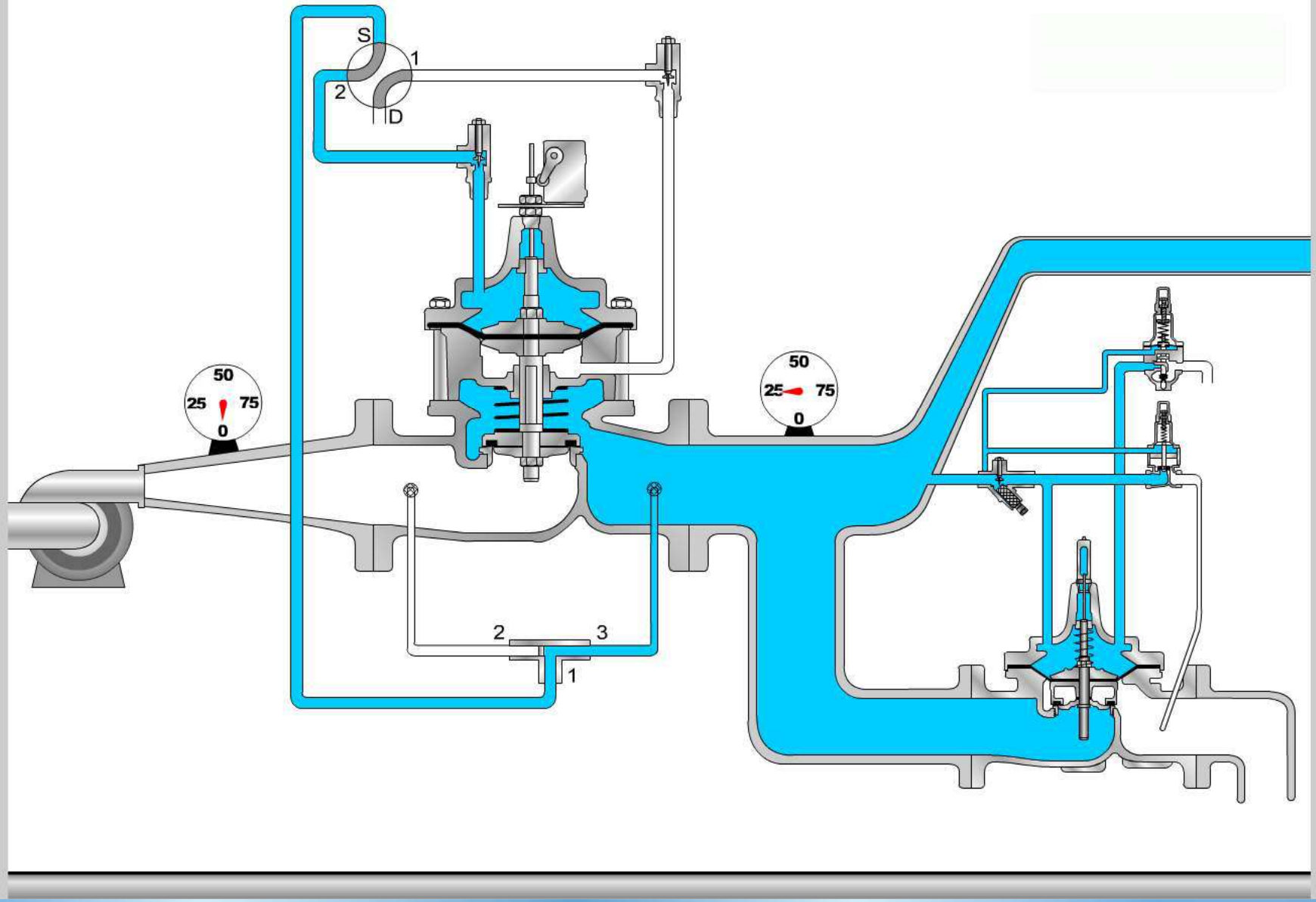
EXIT

60-11 Booster Pump Control Valve

PLAY PAUSE RESTART



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What is Surge?

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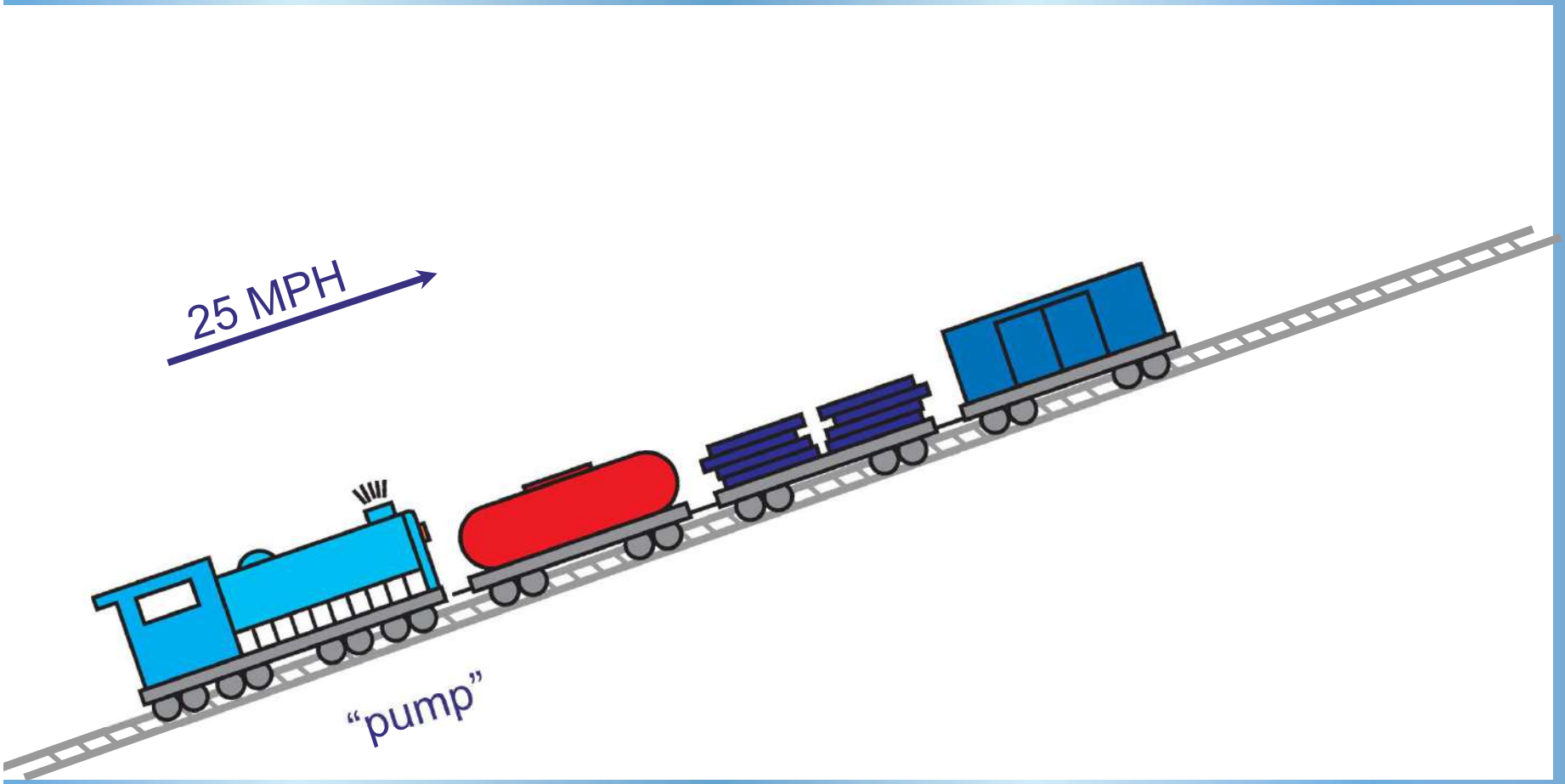
Surge Train #1:
Pumping is Normal



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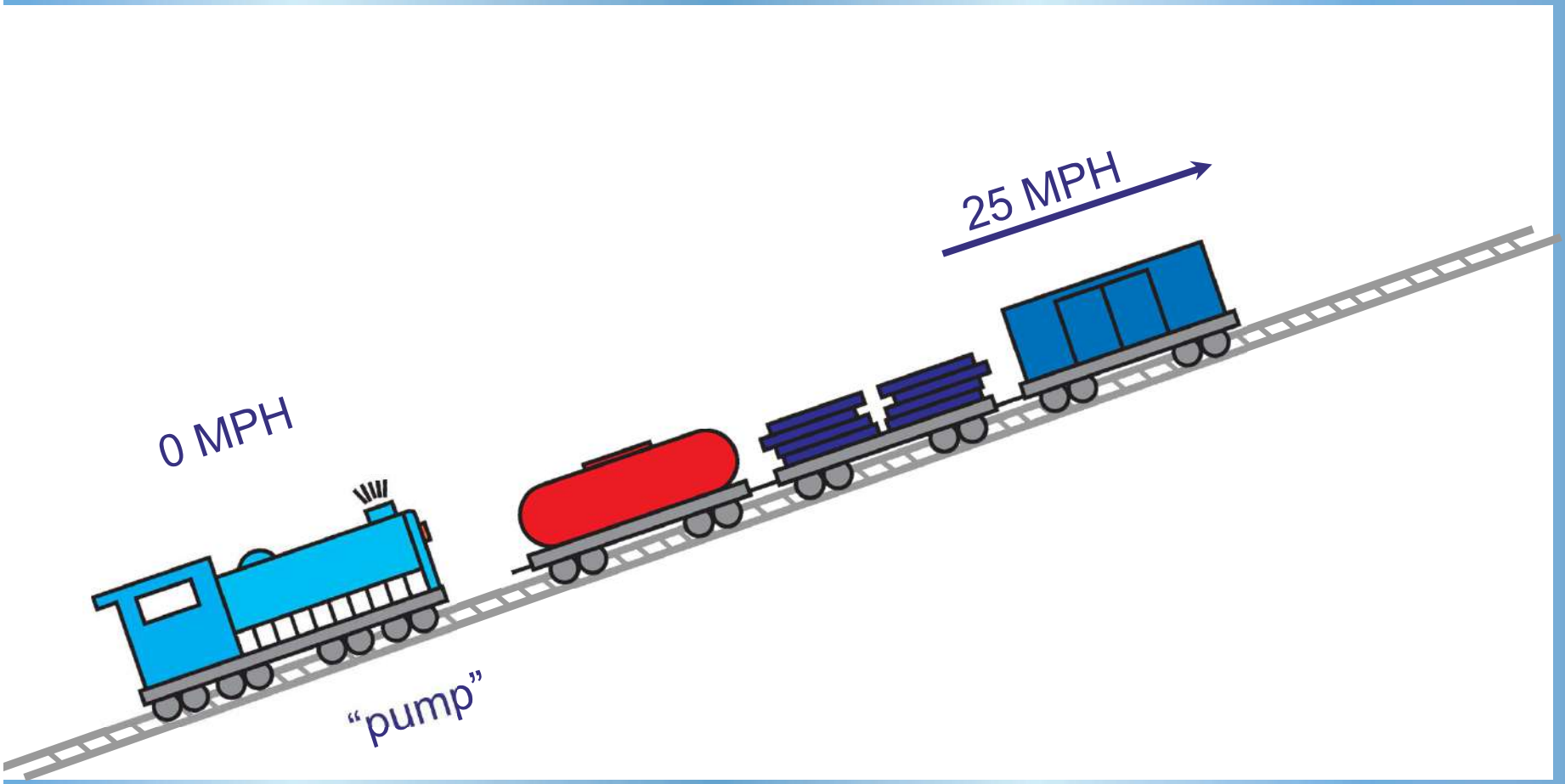
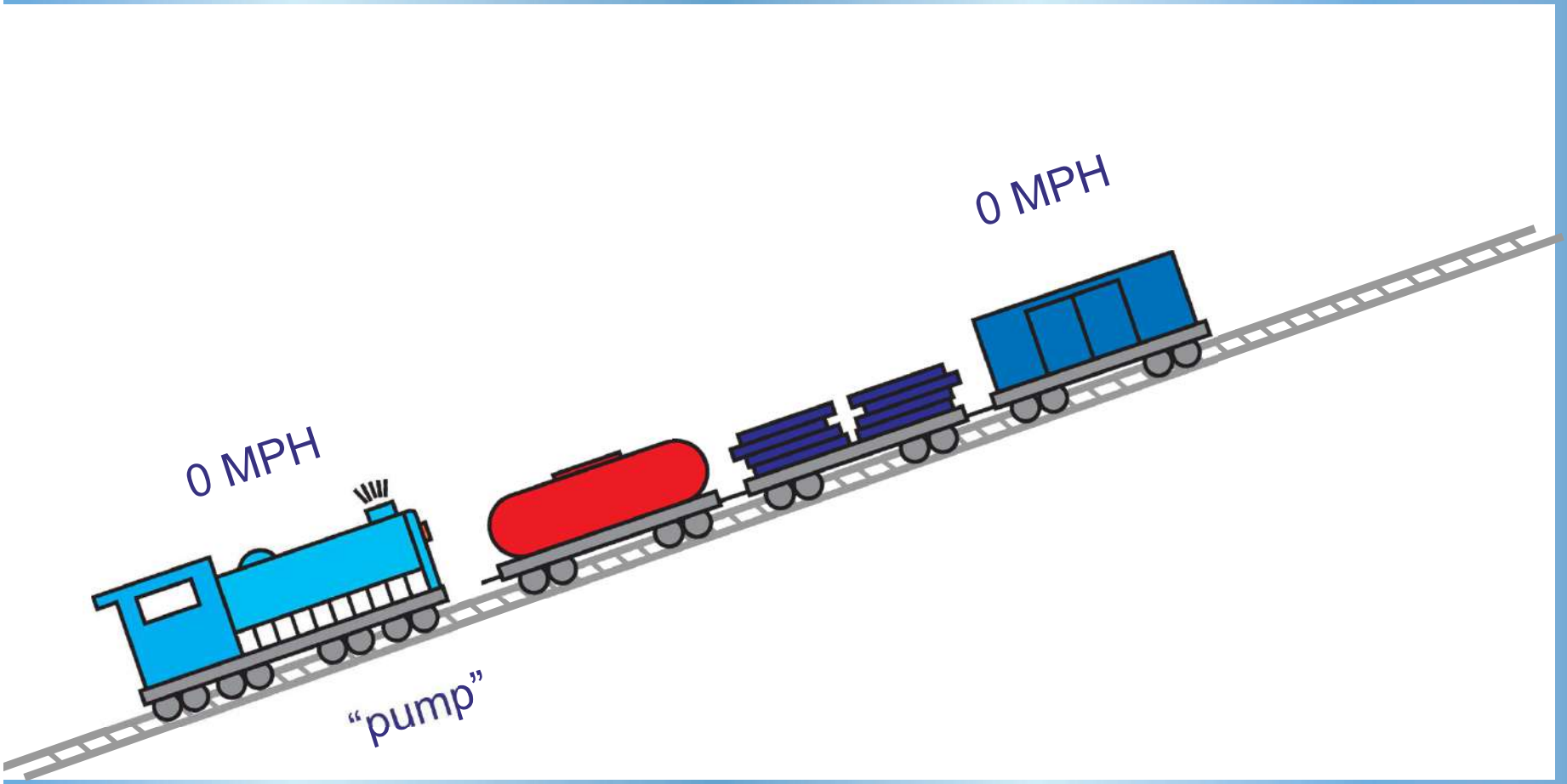
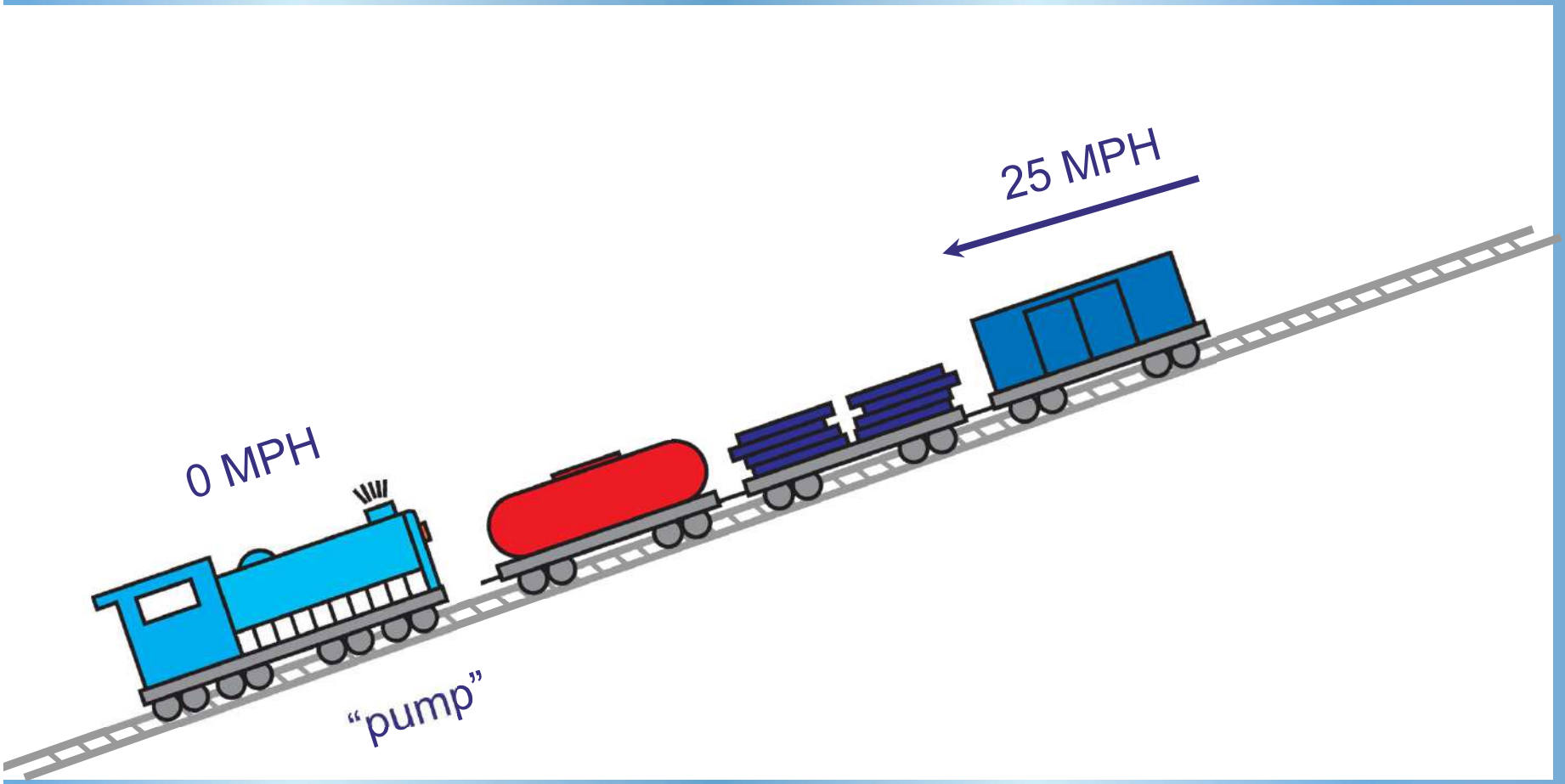
Surge Train # 2:
Power Failure Occurs



Surge Train # 3: Zero Forward Velocity Condition Occurs

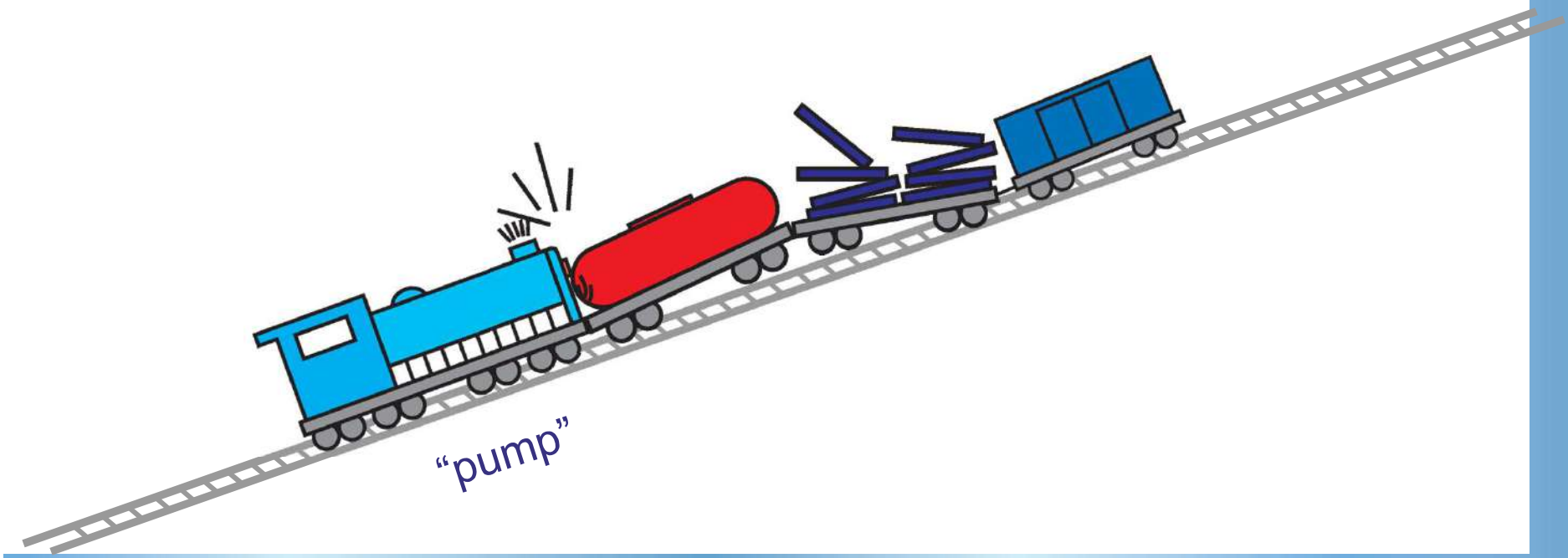


Surge Train # 4:
Return Flow Condition Occurs

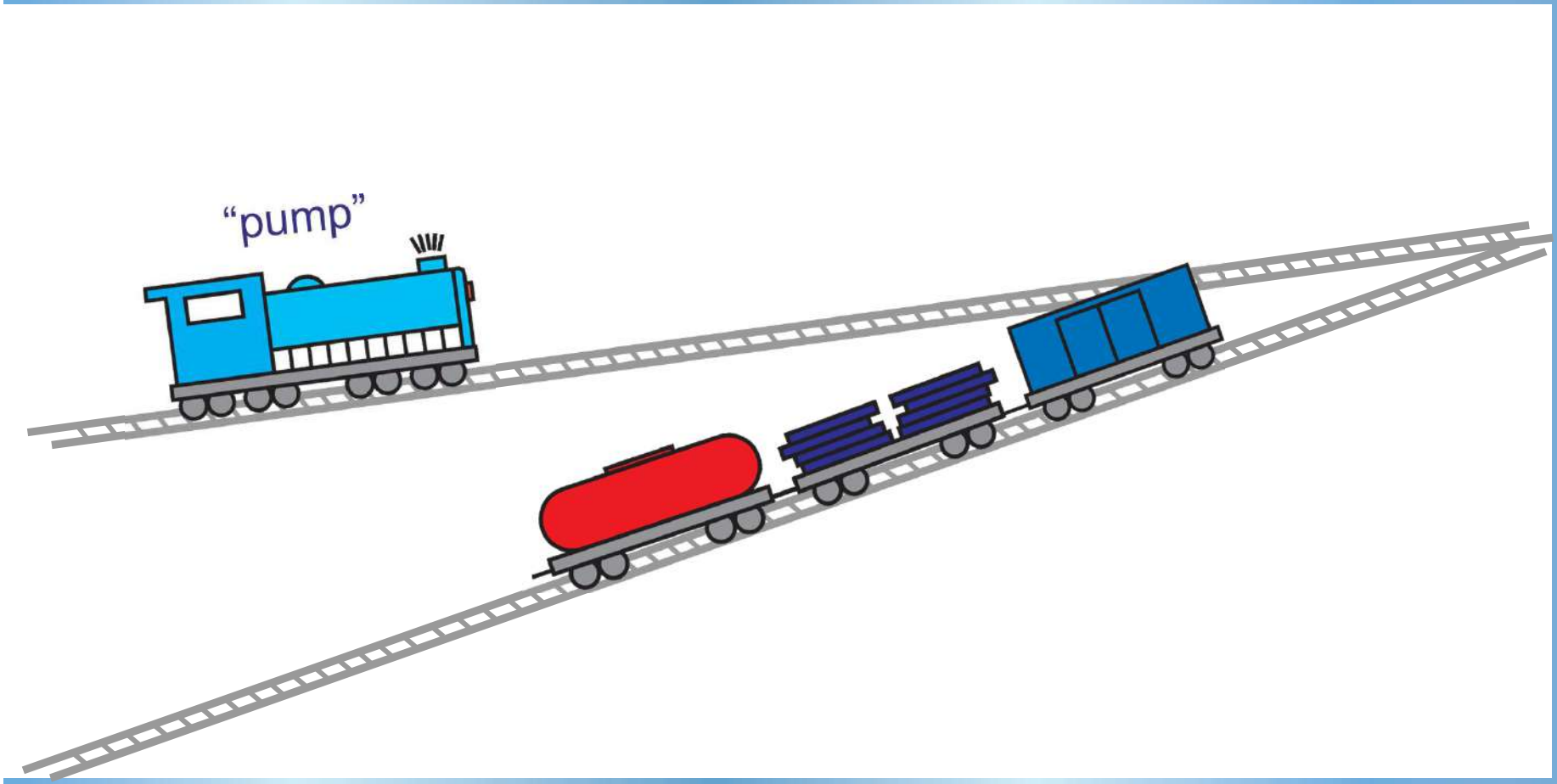


Surge Train # 5:

Surge Condition Occurs,Rapid Change in Velocity, System Energy “Trapped”



Surge Train # 6: Pressure Surge Condition Occurs, System Energy “Released”



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Surge Control Valves

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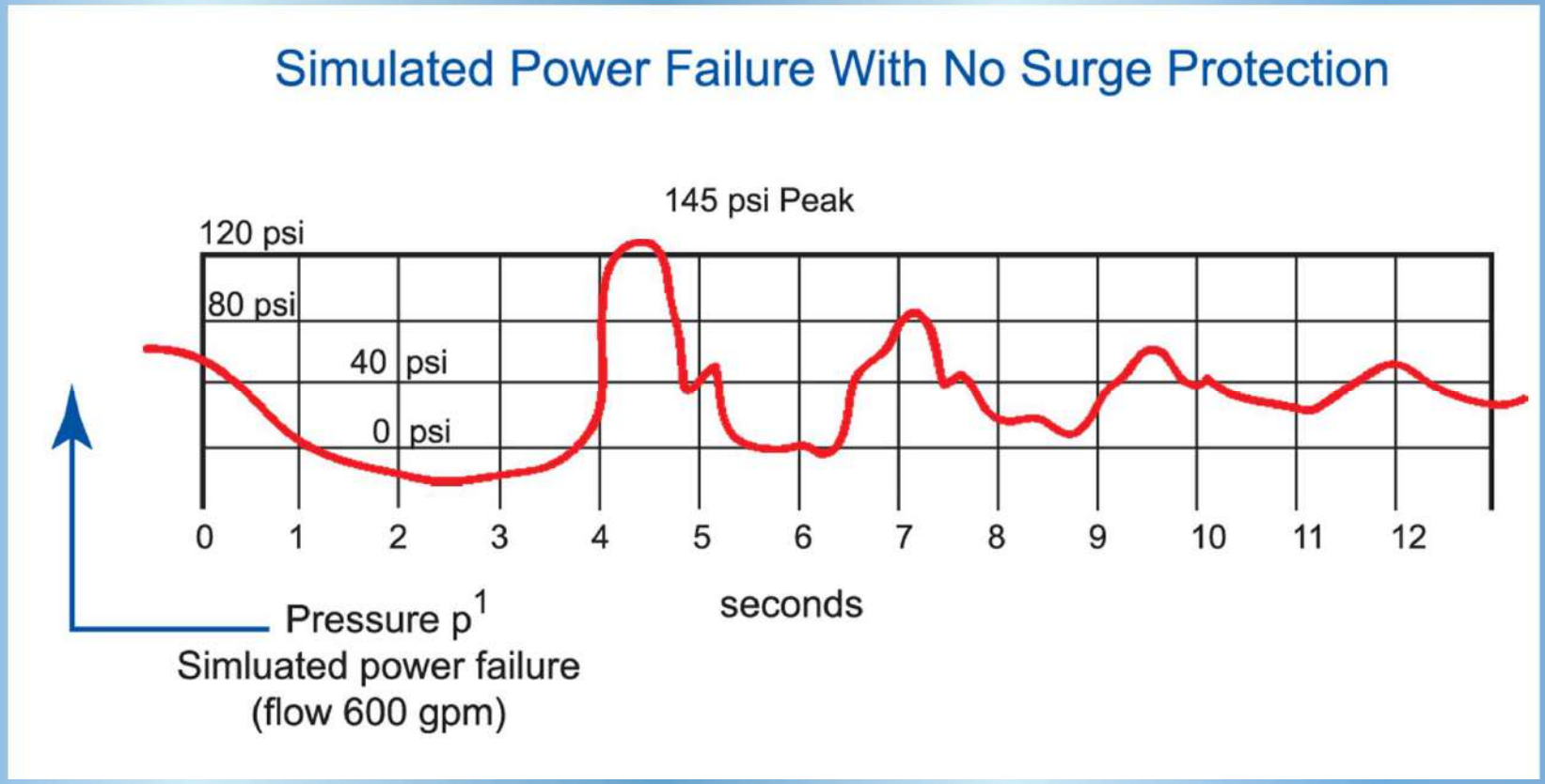
Test Curve with No Relief Valve



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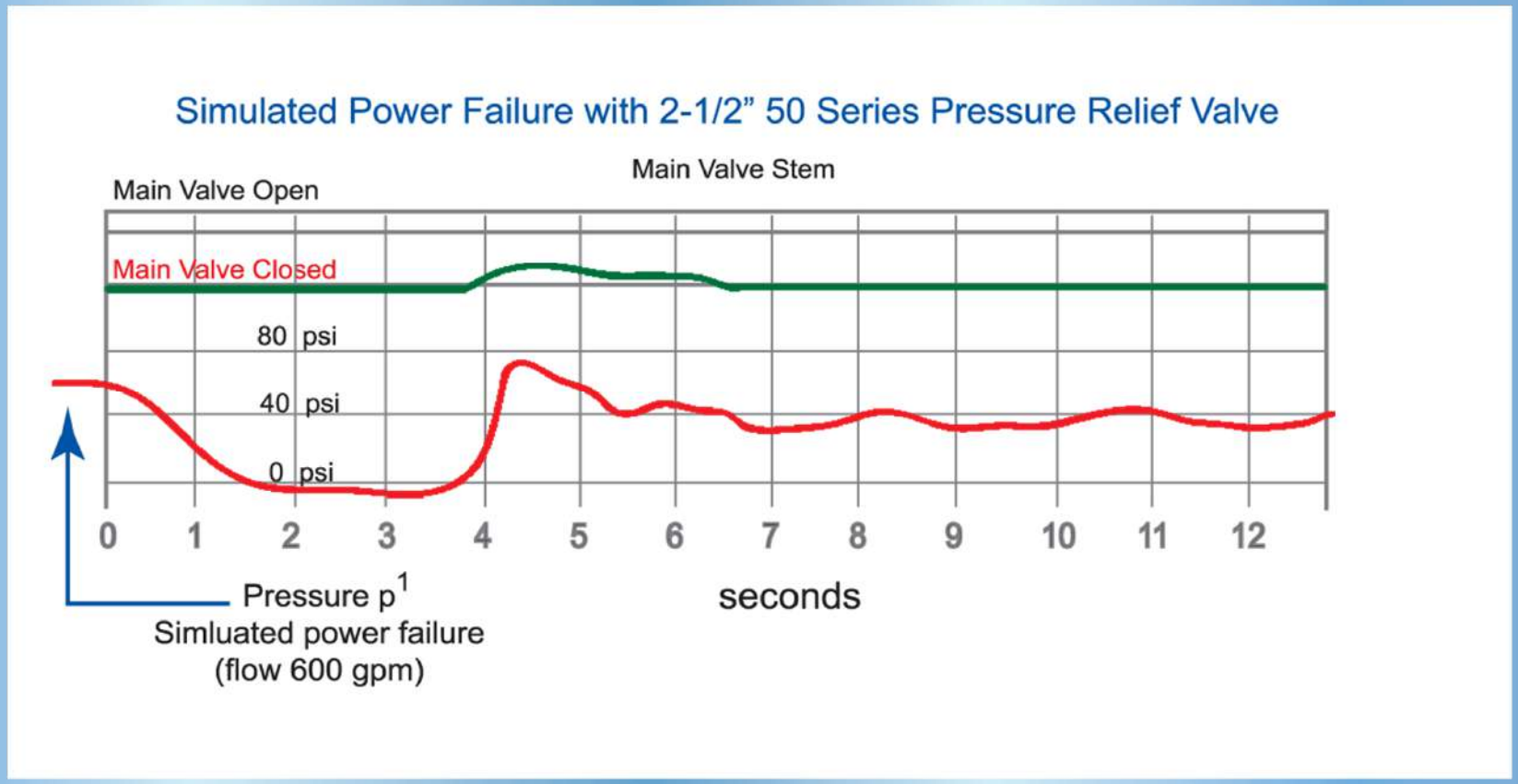
Test Curve With Standard Relief Valve



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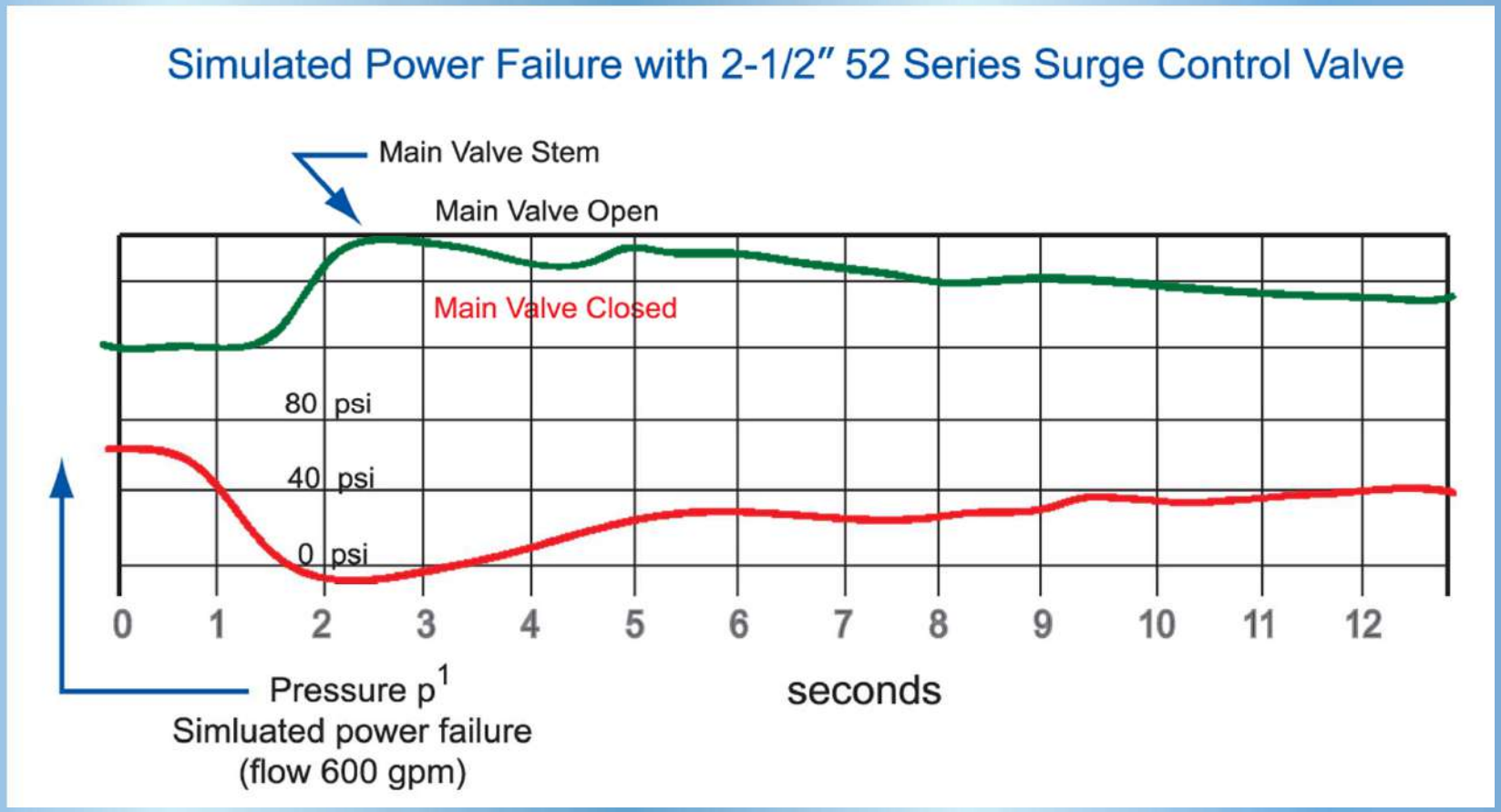
Test Curve With Anticipating Relief Valve



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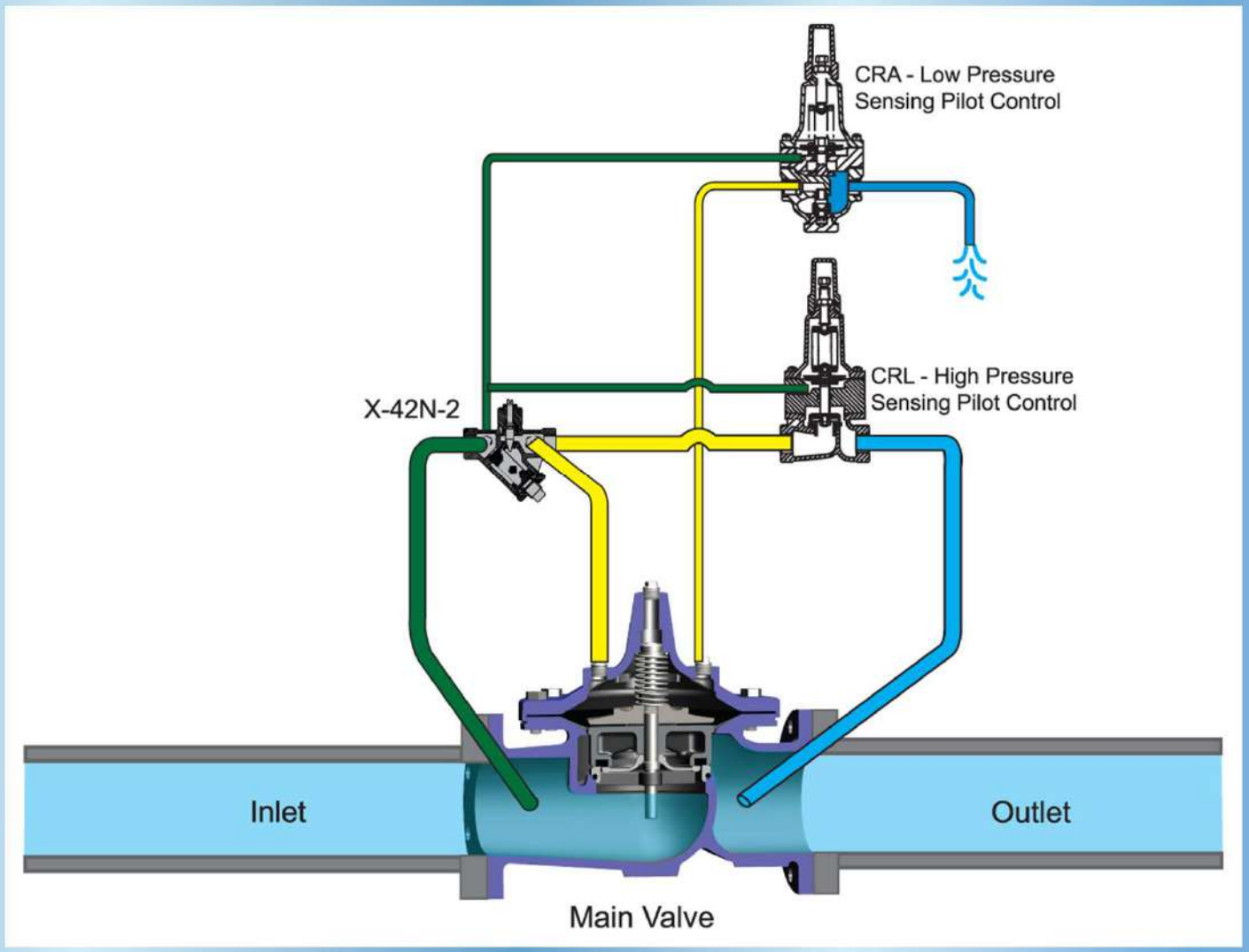
Basic Surge Anticipator Pilot System



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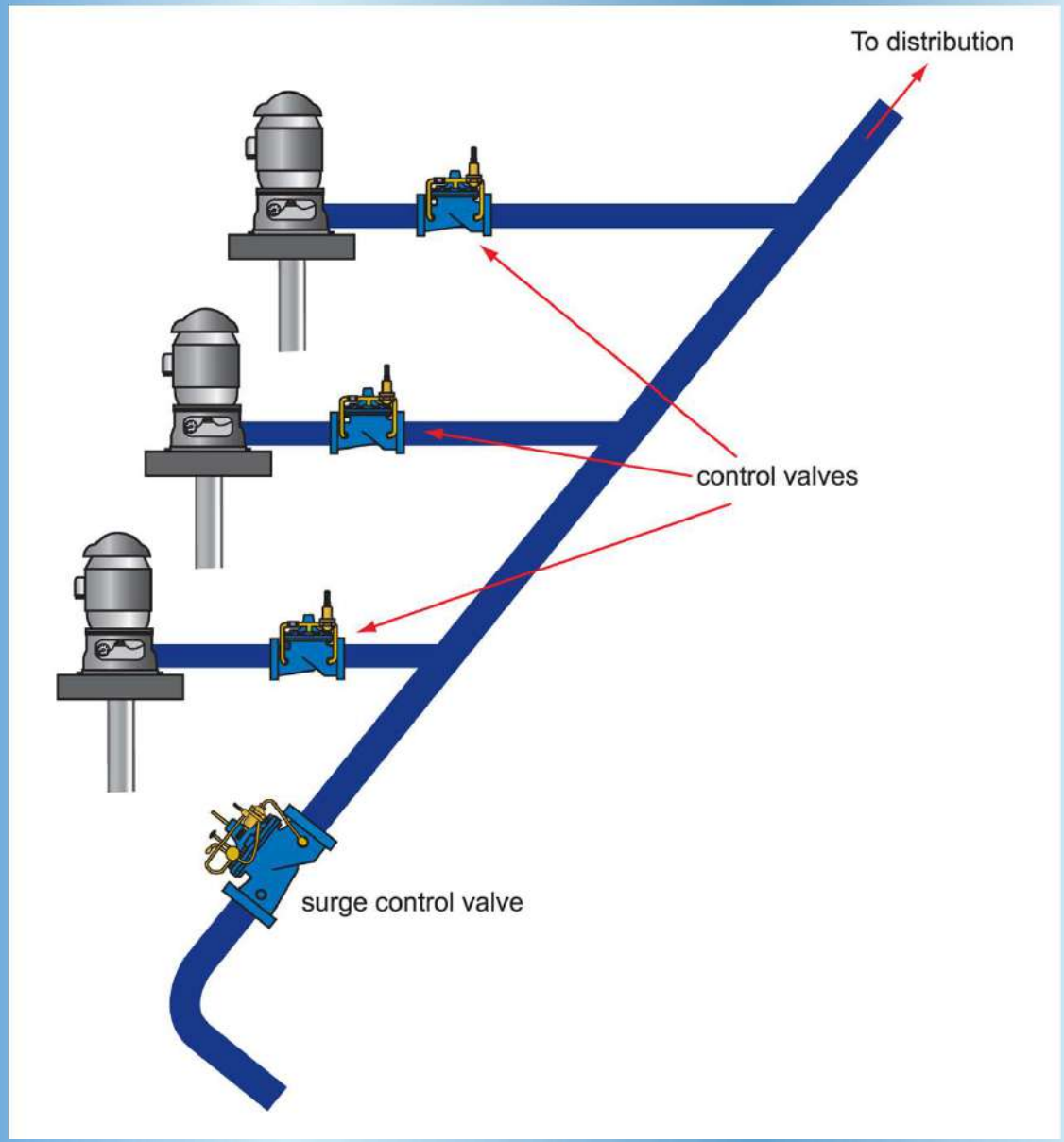

Typical Installation at Pump Station

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Basic Troubleshooting

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Basic Questions…

- Is the valve installed properly?
- Valves function in the system?
- Have any modifications been made?
- Do you have accurate inlet and outlet pressure gauges?
- Are the isolation valves open?
- If solenoid operated – power to the coil?
- Have you consulted the technical manual? www.cla-val.com

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Why control valves don't work…

- Misapplication?
- Misinstallation – no water or electricity - sense lines connected?
- Inadequate maintenance

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Preventative Maintenance

- Reduces operating cost
- Valve not open fully (reduce flow or pressure)

OR

- Valve will not close (over pressurized system at night)
- Eliminates most emergences and associated damages

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Preventive Maintenance is a Program of :

- Scheduling maintenance – every year/ five year rebuild
- Keeping accurate service records!
- Regular cleaning and inspection – usually once a year.

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Preventative Maintenance Record

Valve No. _____ Installed _____
Location _____
_____
Upstream Pressure Downstream Pressure
Flow Rate _____
Function _____
_____
Size ___ Cat. N o. _____ Code _____
Control Settings _____
_____
Electrical _____
_____
Other _____
_____
Date Service Performed and Parts Used
_____
_____
_____
_____
_____
_____
_____
_____

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Working safely while Troubleshooting and Servicing

- In traffic areas – Keep a defensible traffic space, light boards etc.
- Vaults/confined space – Gas detectors, tripod, harness blowers etc.

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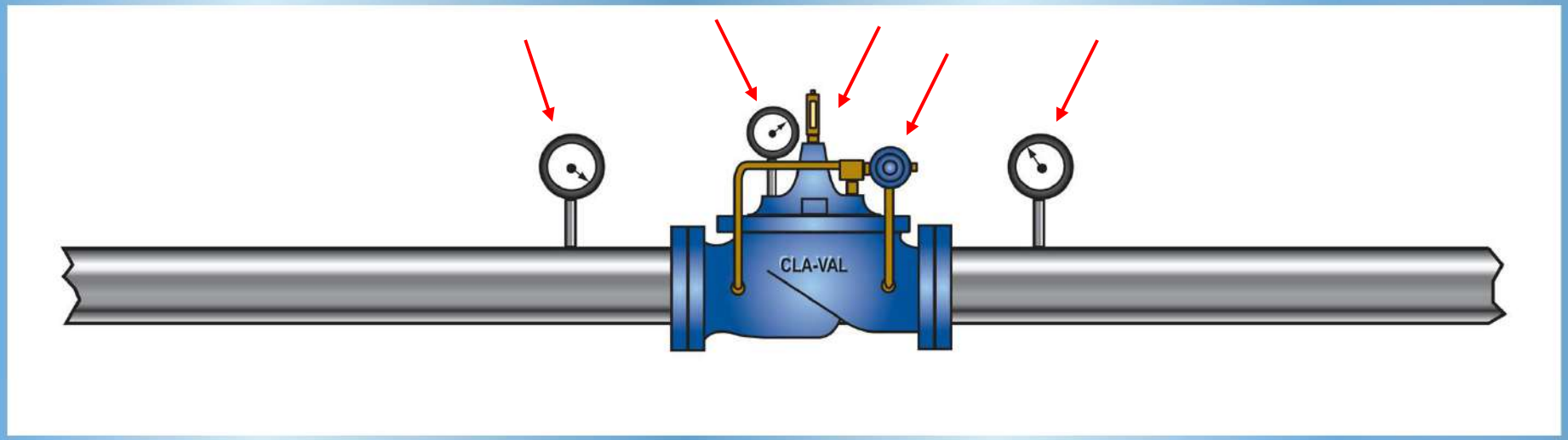
Hytrol Troubleshooting



- Check the effect in the system before testing
- Check pilot system components
- Use three gauges
- Use X101 Valve Position Indicator
- Perform the three Hytrol checks:
  1. Diaphragm test
  2. Stem freedom of movement test
  3. Disc & seat test

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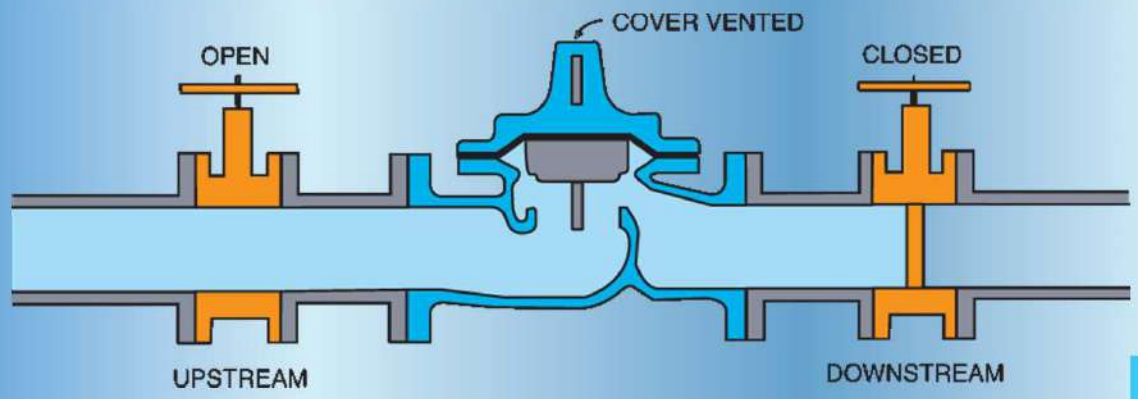

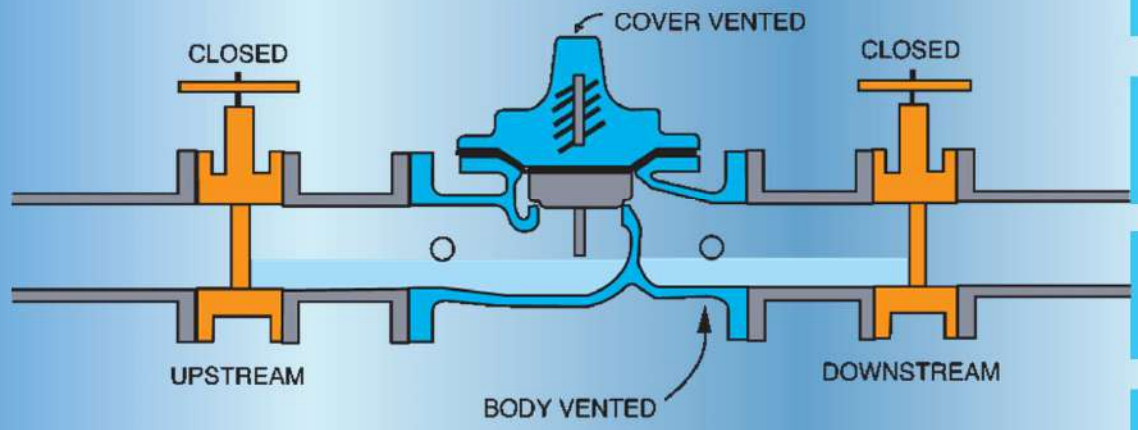

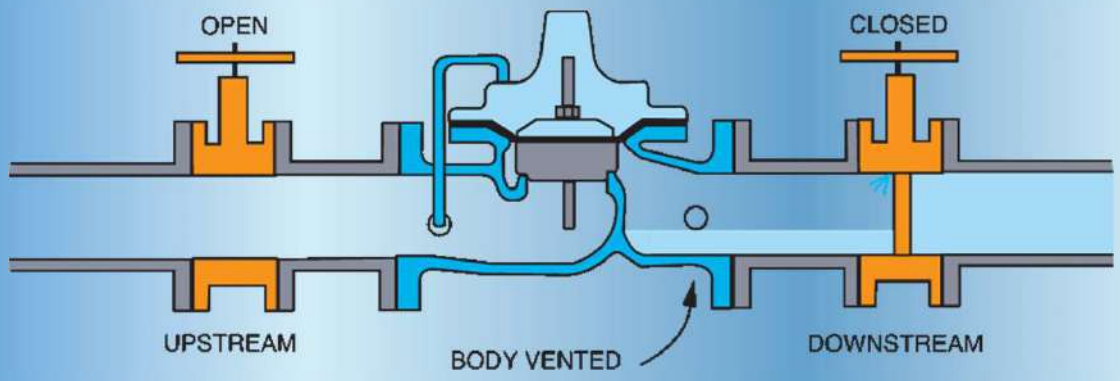

Three Hytrol Checks:

- Diaphragm test
- Stem movement test
- Disc & seat test

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Successful Troubleshooting

1. Understanding how the valve works
2. Working safely and efficiently
3. Using test instruments
4. Performing testing in proper sequence

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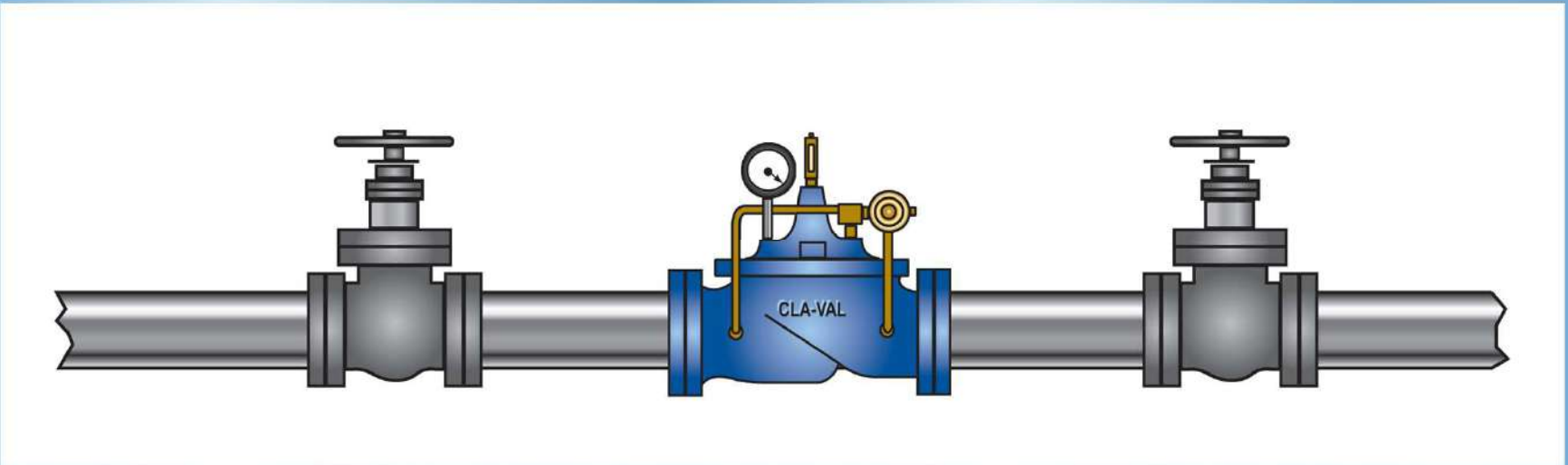
Start-Up Procedures



1. All isolation valves are closed
2. Slightly open inlet isolation valve
3. Install X101 and gauges
4. Bleed air at all high points (pilot control and main valve)
5. Fully open inlet isolation valve
6. Adjust pilot controls to closed position and open all shut-off cocks
7. Slowly open downstream isolation valve
8. Set pilot controls after flow begins

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